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VIEWS, NEWS AND INTERVIEWS.

The New York Board of Aldermen last week granted permission to the Dry Dock, East Broadway & Battery surface road to operate four storage-battery cars on its line as an experiment. The same company recently applied to the Park Board for permission to change its motive power from horses to electricity. The application was denied.

A plan for the consolidation of nearly all the electric light and power plants in Portland, Deering and Westbrook, Me., is under consideration.

Mr. Justus Eck, managing director of Laing, Wharton & Down, London, has been a recent visitor in the United States, investigating the latest features of electrical progress in this country. Mr. Eck has traveled quite extensively in the United States and is greatly pleased with the cordial reception he has received. He sailed for Europe last week. His company is the London representative of the Okonite Company, Limited.

Edison's phonograph has had a battle royal with Russian press censorship, says the *Anglo-Russian*. In the pavilion of the public gardens in Tagonrog, the machine was exhibited, and attracted large audiences. It played and sang, and laughed and spoke for some time undisturbed, until a police officer heard the machine reciting one of Kriloff's famous fables, viz., "Demyan's Ukha" (soup or hospitality), but with some variations on the original text. The officer got suspicious, and not trusting to his memory, he ran at once and got Kriloff's book, and came again to listen to the phonograph's version of the fable. To his horror he found the fable reproduced not at all as it was passed by the censorship more than half a century ago. An alarm was raised at once, the higher local authorities communicated with, and the manager of the pavilion, Mr. Parafinovitch, was called upon to explain the behavior of that speaking American beast. All the poor manager could do was to open the mysterious inside of the criminal machine and hand over to the authorities the indiscreet cylinder which threatened to tell the peaceful inhabitants so many undesirable things. But the arrest of the chief criminal was considered insufficient, as it could not have acted without a human accomplice. So, according to the Taganrog *Viestnik*, the affair has taken its official course, and the innocent manager of the pavilion has lost in the meantime his generally good appetite and sound sleep, as he does not know in what punishment the official proceedings will result, and how long he will have to wait until his fate is decided.

President Henry B. Cutter, of the Cutter Electrical and Manufacturing Company, Philadelphia, visited New York city last week.

The Mildé and Mondos Electrical Cab.

Messrs. Mildé and Mondos, of Paris, have lately completed an experimental two-seated electric carriage, the success of which has decided them to take in hand the construction of an electrical cab of a design similar to that shown in Fig. 1, and according to the draft specifications furnished to London *Industries and Iron*, the details of the arrangement to be adopted are as follows: The motor C (Fig. 2), which is of the double-wound type, is enclosed in a box under the center of the bottom of the vehicle body. Two speeds are provided, the speed gear being fitted in the motor-box, and controlled by friction clutches. Gear wheels are mounted on the ends of the motor shaft, these communicating the power to the wheels I on the intermediary shaft. From the latter to the rear wheels the power is conveyed through a single chain. The accumulators A are carried in a recess at the rear of the vehicle. The battery comprises 42 cells enclosed in ebonite boxes, the total weight of which when charged is nearly 9 cwt. The capacity of the accumulators is 9 kilowatts, sufficient, it is claimed, for a run of from 45 to 50 kilometers, the average discharge, at a potential of 50 volts, being 30 amperes, with a maximum of 60 amperes. With the view of reducing the vibration the carriage body is connected to the frame by a double set of springs, while the design is such that the load is evenly distributed. The rear axle runs in oil boxes; the road wheel on the chain side is keyed rigidly to the axle, the latter carrying one of the bevel wheels of the differential gear. The other bevel wheel of the differential is mounted on the hub of the opposite road wheel, the latter running loosely on the axle.

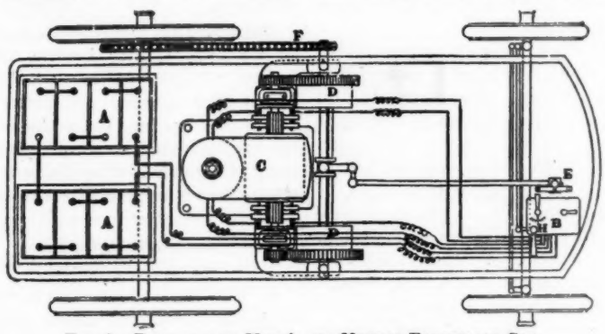

Fig. 2.—Plan of the Mildé and Mondos Electrical Cab.

Fig. 1.—The Mildé and Mondos Electrical Cab.

All the maneuvering gear is so connected together that in applying the brakes the accumulators are disconnected from the motor. The latter can be run in either direction by first breaking the contact and then reversing the switch. Two brakes are provided, one operated by the foot and one by a handwheel. The steering and speed-changing levers, H and E respectively, are all arranged within easy reach of the driver. The maximum speed of the carriage is 15 kilometers (9⅜ miles) per hour, but by means of the two-speed gear and the switch B, any rate of speed, between 2 and 15 kilometers, may, it is claimed, be obtained. The dimensions of the carriage, which is intended for two passengers exclusive of the driver, are: Length, 10 feet 3 inches, and width 4 feet 9 inches. Its total weight, including three passengers, is estimated at 1,570 kilogrammes (30¾ cwt.) made up as follows: Weight of carriage, 750 kilogrammes; ditto accumulators, 450 kilogrammes; ditto motor and power-transmitting mechanism, 160

kilogrammes; and ditto of three persons, 210 kilogrammes.

In connection with the projected cab, which Messrs. Mildé and Mondos intend at present for private use only, they have prepared plans of a combined carriage shed and charging station in conjunction with large private residences, the current being taken from the supply mains in the streets.

LITERARY.

Cassier's Magazine for January includes in its table of contents an article by E. H. Mullin entitled "Electric Power in the Machine Shop," illustrated with 15 engravings.

McClure's Magazine for January yields perhaps its first attraction in its pictures. As an example of general excellence in magazine illustration it is, indeed, an extraordinary number. Every picture but one—a beautiful reproduction of Burne-Jones's painting "Vespertina Quies"—has relation to the reading matter; is strictly illustrative, in other words; but such is the intrinsic interest of them and the vividness of their execution, one derives from simply running through the number and looking at them that mental satisfaction which is usually to be had only from reading. They are, in other words, each and all, a good story in themselves. But then this is what the pictures naturally would be in *McClure's*, which lives to the rule of never failing, whatever else happens, to tell a good story.

An exquisite drawing by Wenzell, illustrating a Christmas poem of Clinton Scollard's, and a double-page of "Christmas Eve in the Klondike," by S. Werner, are particularly effective features of the current *Collier's*. There are, in addition to poems by Margaret E. Sangster, Joel Benton and Charles Gordon Rogers, two short stories by Curtis May and Wardon Curtis. The regular contributors to this excellent weekly, Julian Hawthorne, Edgar Saltus, John Habberton and Edgar Fawcett, are men of sterling literary fame, whose writings embody the best thought of the day in life and literature. The editor of *Collier's* promises many striking improvements within the coming year, among them frequent illustrations from artists of world-wide reputation—Remington, Wenzell, Lafarge, Howard Pyle, Eric Pape, Thulstrup, Peter Newell and Alice Barber Stephens; serial stories by Henry James and Mrs. Cruger ("Julien Gordon"), and a new lyric by Swinburne.

Heavy Accident Damages.

William Johannes's suit against the Nassau Railway for $25,000 damages for loss of a leg, by being run over by one of the company's cars, has resulted in an award of $15,000 by a jury in the Supreme Court. The railway's motion for a new trial was denied. The whole question hinged on whether Johannes was or was not intoxicated at the time. More than 30 witnesses appeared for the plaintiff.

PERCHOID.

BY H. MARTYN HART, D. D.

One of the well known surgeons of London two generations ago was Mr. Napier Ford. Mr. Ford was not only a surgeon of repute, but he possessed the inventive faculty in an eminent degree. Many surgical instruments still bear the marks of his resource. But his chief work was with oils. He invented a substitute for glass, with which many conservatories and large buildings are roofed. It is transparent and yet not brittle. For six years he steadily pursued his experiments to perfectly oxidize oil. It is well known that linoleum and that class of goods is oil imperfectly oxidized. A Mr. Walton secured patents in England and the United States for his process.

This consists in suspending from a gutter a sheet of sleazy muslin; linseed oil is allowed to run into the gutter and lap over down the sheet. As it is thus exposed to the air, some of it becomes oxidized, and in time the sheet is covered with about an inch of thickened oil. The sheet and the adhering pasty mass is ground together, and this is the foundation of linoleum.

Mr. Ford, however, hit upon a plan by which every particle of the oil is fully oxidized. He heated the oil with litharge, continually stirring it with a revolving paddle for many hours. The oil is then allowed to cool. Tow, properly prepared, is dipped into this oil, placed in wire baskets and exposed, in diverse ways, to currents of air. The oil adhering to the filaments of the hemp became wholly oxidized. Under the microscope the threads of hemp appear sheathed with a coating of amber. Upon running this through masticating rollers, a sheet of leathery material appears. This material is, in fact, closely allied, if not identical in its chemical composition, with india-rubber. By further processes of manipulation it becomes more and more like india-rubber, acquiring considerable resilience. It is found that mixing it with sulphur increases its tenacity. It readily mixes with any pigment.

Perchoid, as Mr. Ford named it, shows many extraordinary qualities. It can be rolled as thin as a piece of tissue paper on any fabric and on leather; the leather becomes impervious to moisture, but not to air. It would seem that rubbers will not be wanted in the near future, and, as it takes an efficient polish, a wipe with a wet sponge will "shine" our boots. "India-rubber sheeting" is made of it at one process; imitation leather for cushions and buggy tops, etc., it makes excellently; no air, no exposure, no sunlight, no boiling, no acids have the slightest effect upon it. A chemical manufacturer in Birmondsey, whose hydrochloric-acid tank used to be lined with gutta-percha, at a cost of $50, and had to be renewed, had his tank lined with perchoid for $1.50, and the acid has no apparent effect on it. Hydrofluoric acid will remain in a tank so lined perfectly clear. For steam and water packing it is better than rubber, because grease, which readily causes rubber to disintegrate and which is always about machinery, has no effect on it. All sorts of waterproofing it produces eight or 10 times cheaper, and more endurable than rubber. It is a good electrical insulator, because it never becomes brittle and never leaves the wire. Its cheapness—five or six cents a pound—will stimulate its use. No doubt pneumatic tires will be made of it, and the wear of solid tires made of it is very gratifying. The openings for roofing and flooring with perchoid are interminable.

Mr. Ford died four years ago, and the perchoid interests came into the hands of Mr. Charles Grist, an electrical engineer. He has made such improvements in the manufacture that he has taken out patents in his own name. Patents have been secured in this country, and preparations for its manufacture are in process.

Pegamoid, which is just being thrust into public notice, is a soluble celluloid, with which fabrics are soaked. The material thus produced is waterproof, and possesses some useful qualities.

A company has just begun to manufacture perchoid near London, and finding "Pegamoid" advertised so largely they changed the name of perchoid to oxylin. But in America the original name perchoid, something of the nature of percha, will be retained out of respect to its inventor.

Wireless Telegraphy.

[*From the London Electrical Review.*]

In your interesting article on this subject in your issue for the 8th instant you say: "We think there can be no doubt that Marconi is the true and first inventor of the elevated electrodes on the receiver and transmitter."

In a book entitled "The Inventions, Researches and Writings of Nikola Tesla," published early in 1894, pages 346–9, will be found much interesting matter with regard to what is therein termed "the transmission of intelligible signals, or perhaps even power, to any distance without the use of wires." In particular, an arrangement of transmitter and receiver, each connected with one terminal to earth, and with the other terminal to an insulated body of large surface, shown in a diagram as elevated above the earth, is suggested for the purpose of what is indexed as "telegraphy without wires."

Without in any way desiring to detract from the credit that is due to Mr. Marconi for the results that he has obtained, I think that it is only fair to Mr. Tesla that attention should be called to the above.

A. A. C. SWINTON.

October 22.

Mr. W. H. Preece, C. B., F. R. S., the engineer-in-chief of the British General Post Office, who has been on the sick list for several weeks past, is recuperating on the Mediterranean.

ELECTRIC RAILWAY NOTES.

The Ferry street car house of the West End Street Railway Company in Everett, Mass., was destroyed by fire last Friday, together with 90 of the road's most valuable electric cars. The total loss will be nearly $150,000.

The New Jersey Electric Railroad Company, which operates the trolley lines between Singer and Hoboken, running through Paterson, Passaic and Rutherford, has gone into the hands of a receiver in consequence of default in the payment of one year's interest at five per cent on a mortgage of $3,500,000.

At the annual meeting of stockholders of the Rapid Transit Railway Company, of Syracuse, N. Y., the following officers were elected: W. M. Brown, of New Castle, Pa.; Theodore H. Conderman, of Philadelphia; D. A. Coffinberry, of Cleveland; Charles R. Flint, L. K. McClymonds and Edward Cornell, of New York, and W. R. Kimball, W. P. Gannon and A. C. Chase, of Syracuse. At a meeting of the directors, to be held soon, the following officers will probably be re-elected: President, W. M. Brown; vice-president, W. R. Kimball; treasurer, T. H. Conderman, and secretary, W. P. Gannon. Mr. Conderman has been treasurer since October, Mr. Chase having resigned that office.

It is rumored that there will be a reorganization of the Fort Wayne, Ind., (Consolidated) Electric Railway Company, which has control of all the lines in that city and is now in the hands of M. Stanley Robinson, formerly general manager, and John H. Bass, as receivers. The company went into the hands of receivers over a year ago, the alleged cause being the appropriation of $1,500,000 in bonds by J. J. Shippard, of Cleveland, Ohio, to his own use, against whom charges are now pending in that city. It is understood that the Robinsons, of Cleveland, the heaviest stockholders in the company, will withdraw, also Mr. Bass, vice-president. E. M. Scott, representing Chicago capitalists, was recently in Fort Wayne examining the plant. The personnel of the new company has not been disclosed.

The Lincoln, Neb., Street Railway, comprising all of the lines in the city operated by electricity, was sold at foreclosure sale on December 17 for $60,500, subject to the lien of the city for taxes to the amount of $60,000. The purchasers were M. L. Scudder, of New York, and William Belcher, of New London, Ct., representing the first and second mortgage bondholders, the New York Security and Trust Company, and the New York Guaranty and Indemnity Company. The first mortgage bonds amount to $500,000, with five years' defaulted interest, and the second mortgage bonds to $840,000. The two trust companies are not owners of the bonds, but trustees for several hundred owners, who lose a large percentage of their money, the road equipment and franchises, it is said, being worth less than $200,000.

Tragic Death of a Telegraph Superintendent in Persia.

We regret to announce the death of Mr. E. Graves, assistant superintendent of the Persian Gulf Telegraph, which took place in Persia last week under particular shocking circumstances, says the London *Electrical Engineer*. Mr. Graves was inspecting the line between Jask and Chauber, at a distance of 90 miles from the former place, when, according to Reuter, he was attacked in camp by tribesmen, who entered his tent at dusk, and, pinning him to his bed, disemboweled and decapitated him. The native staff escaped, but the camp was looted and destroyed.

The following additional facts were published in the *Daily Telegraph* of December 8: "Inquiries made by a Dalziel representative confirm the report of the murder in Persia, at a point to the east of Jask, near the entrance to the Straits of Ormuz, of Mr. E. Graves, assistant superintendent of telegraphs under the Indian Telegraph Department. So far as is known at present, Mr. Graves had reached the Rafich River, between Jask and Gwador, and was there murdered while in bed, the object of the crime being robbery. No further details had been received at the India Office up to a late hour last evening. It is believed, however, from information received of Mr. Graves's movements, that the murder must have occurred between Thursday night and Friday morning. Fortunately, Mr. B. T. Ffinch, C. I. E., director-general of the Indo-European Telegraph Department, of the India Office, who left England by the P. and O. steamship "Rome," on November 4, was at Kurachi when the report of Mr. Graves's murder was received, and at once left for Jask, where active steps will immediately be taken for the detection and punishment of the murderers, who, it is believed, can be identified. In this work Mr. Ffinch will receive every assistance from the British political agent at Bushire, Lieutenant-Colonel Talbot, and the naval force in the Persian Gulf. Further news of the punitive measures to be taken can not be known for some days, as Mr. Ffinch will not arrive at Jask until Thursday or Friday. Everything possible is being done by the Persian Government to assist in securing the murderers. Mr. Graves, whose career has been brought to so untimely an end, has been over 30 years in the service of the telegraph department, and had only six months to serve, when he could have claimed his pension. He was born on December 5, 1844, and had thus almost attained his fifty-third year. Mr. Graves was for some years in the Royal Engineers, in which he attained the rank of sergeant, and went out to Persia in August, 1863, where he has been principally engaged ever since. In 1878 he left the army, and was appointed to the civil staff of the Indian telegraphs in that year. The sad news of his death was conveyed yesterday to his wife, who, with her son, is at present residing near London."

The Cross Oil Filter.

An oil filter which has been highly indorsed by a large number of users is the "Cross," illustrated herewith, made by the Burt Manufacturing Company, 222, 224 and 226 South Main street, Akron, Ohio. The company has been established eight years and has an extended trade throughout the world. Every user of machinery knows the loss sustained through "waste" oil, which could be used again if the impurities were removed.

In Fig. 1 is shown a sectional view of the Cross oil filter. It is made of

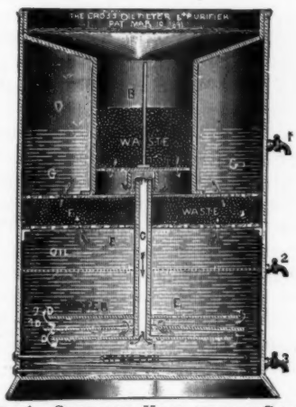

FIG. 1.—SECTIONAL VIEW OF THE CROSS OIL FILTER.

extra grade, heavy galvanized iron, all joints soldered, lapped and riveted. It is neatly painted, with polished brass fittings and nickel-plated rim. The bottom chamber E is filled with pure warm water, which is heated by means of a steam pipe passing through the filter. Very little steam is required, and if the filter is kept in a warm place, it will not be necessary to make steam connection at all.

The waste oil is poured in through top grating A (see Fig. 1). It then passes into chamber B, through the layer of waste, which collects all the heavier impurities. From thence through the perforated bottom of chamber B, down in the direction shown by the arrows into tube C, and from here into filter plate D, where the increased weight of the water has a tendency to keep the oil back in tube C. However, the pressure of oil in chamber B forces it down and spreads it out over plate D in a very thin film, which constantly changes surface and grows thinner as it travels from the center to the circumference of plate D, thus exposing every particle of waste oil to the action of the water. It then flows upon plate D' and D'', going through the same process in each case. When the oil leaves the filter plate D'', it is in a finely divided state of separation and thoroughly mixed with water, which washes it out and from which it separates by gravity all the remaining impurities, which settle in chamber E, and can be removed through cock No. 3. From plate D'' the oil again filters through the stratum of filtering material F, and from there it rises to chamber G, the reservoir containing the purified oil. It is then drawn off as required from cock No. 1.

The Cross special oil filter, designed for electric plants and similar places where a large amount of lubricating oil is used, is shown in Fig. 2. It is constructed from extra heavy galvanized iron; all seams are lapped, riveted and soldered. The finish is a rich, bright cherry red, all fittings of burnished brass, making the filter an ornament to any engine-room. Every part is strongly made, all inside work being rigidly braced and reinforced. Each filter is fitted with a gauge to show the amount of filtered (pure) oil in reservoir. Any size of cocks can be furnished. If preferred, the pure oil cock can be replaced with a gate-valve so that connection may be made direct to bearings, or wherever the oil is to be used.

Niagara Power in Buffalo.*

Two of the largest grain elevators in the world, built in Buffalo, N. Y., during the Summer, at a cost of nearly $1,000,000, are now successfully using vast quantities of the new Niagara Falls power, and within a few weeks, and as soon as the necessary electrical machinery can be installed, the wheels and machinery of the Union Drydock, one of the leading shipbuilding plants on the Great Lakes, will also be turned by the Falls current.

Several other of the city's most important industries also are contemplating changing from steam power to the cheaper and better Falls electric power, and within a very few months it is certain that energy from Niagara Falls will be in very general use by the great manufacturing and commercial establishments throughout the city.

The Cataract Power and Conduit Company, which has charge of the distribution of Niagara power in Buffalo, has at its disposal practically sufficient power to supply all demands by Buffalo manufacturers for a long time to come. Already the Buffalo General Electric Company has contracted for 3,000 horse-power, to be used in lighting the city. The Buffalo Street Railway Company receives 2,000 horse-power, 1,000 of which has been in use since November, 1896, for operating its cars. The Great Northern elevator receives 1,000 horse-power and the new Electric elevator 450 horse-power, while the Union Drydock Company will use between 500 and 1,000 horse-power.

A Health Exposition.

An International Health Exposition will be held at the Grand Central Palace, New York city, for five weeks, beginning April 25 next, under auspices and with a breadth of scope which are a guarantee of conscientious and intelligent effort, and which can not fail to awaken a widespread popular interest.

There will be a display, covering more than three acres of floor space, of practical apparatus and appliances of all kinds, taking in everything, from Mr. Atkinson's Aladdin stove to a huge garbage crematory in actual operation.

One of the most interesting features will be the department of electricity, showing its applications not only to health and sanitary matters, but as an aid in household economics.

Mr. Luther Stiringer, consulting electrical engineer of the World's Fair, Atlanta, Nashville and Omaha expositions, has been retained in a similar capacity for the International Health Exposition. Mr. John J. Carty, chief engineer of the New York Telephone Company, is the advisory committee on electro-therapeutics.

Mr. Charles F. Wingate, the sanitary engineer, is the supervising director; Mr. B. E. Greene, secretary; Mr. Montgomery Maze, treasurer. Offices of the exposition are now open at the Grand Central Palace.

* From *Greater Buffalo*.

LATE NEWS.

Permission has been granted to the Second Avenue Railroad Company, of New York city, to adopt the underground trolley system on that portion of its line on Ninety-sixth street between First and Second avenues.

It was announced last Saturday that the arbitration committee which has charge of the dispute between the Electrical Contractors' Association and the Electrical Workers' Union, of New York city, has reached a settlement, fixing the rate of wages at $3.50 a day instead of $4, which the men demanded.

Permission has been granted to the Metropolitan Street Railway Company, of New York city, by the State Railroad Commission, to adopt the underground electric trolley system

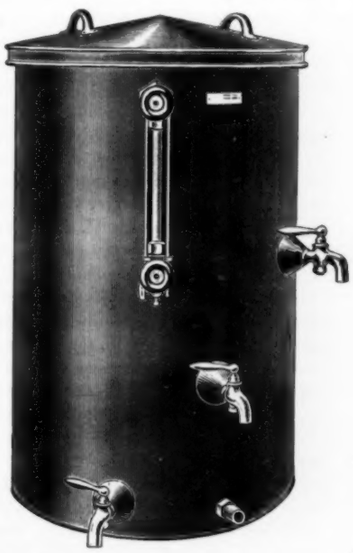

FIG. 2.—THE CROSS SPECIAL OIL FILTER.

as a motive power on that portion of the New York & Harlem Railroad leased by the Metropolitan on Thirty-fourth street, from Second avenue to the Long Island Ferry. In consequence of the large number of cars of the several lines making terminals at the ferry in East Thirty-fourth street, the Railroad Commission has advised the Metropolitan company that sufficient flagmen, trackmen and safety devices on the cars must be provided to guarantee the safety of passengers and pedestrians.

III—HOW TO BECOME AN ELECTRICAL ENGINEER.*

BY "E. E."

Every youth should choose his own profession, and his natural aptitude for any line of business should be known by the time the common school branches are completed. The embryo electrical engineer should have a taste for mechanics, a liking for mathematics and a strong constitution. He will graduate from high-school about the age of 18, twelve years having been spent in the school-room or at play. A rest from text-books is now advisable, and it is time that the young man should learn to work with his hands as well as with his head. Hard work under the rigid rules of a workshop will be a benefit at this time.

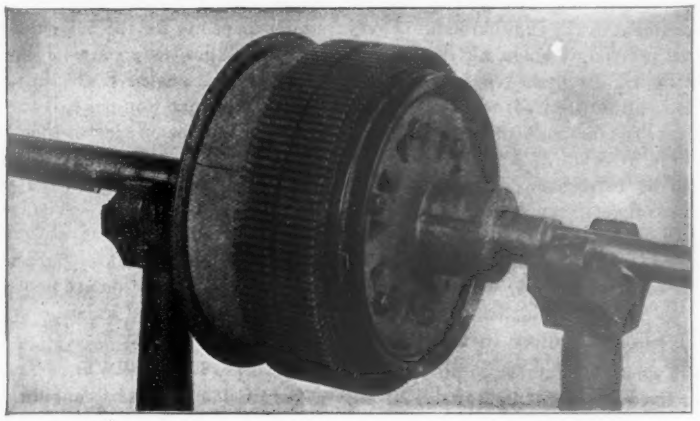

FIG. 1.—ARMATURE CORE FOR 110-KILOWATT GENERAL ELECTRIC BELT-DRIVEN RAILWAY GENERATOR.

If the young man lives in the city there will be no great difficulty in finding employment in some manufacturing establishment, if he is not too choice in the kind of work. It is by no means necessary that it be an electrical establishment, for it is the knowledge of tools and machines that is desired. A small shop is preferable to a large one, for the work will be more diversified. However, the larger shops will have the better equipments, and here the young man will have to get more by observation. The drudgery in doing this hard work, which is often monotonous and requires little thought, is a good lesson, for then the young man begins to realize that any success comes only after earnest and faithful efforts. The compensation for this work will be $4 or $5 per week.

A good mechanical training is highly desirable, and several years of such work might be profitable; but the American youth is impressed with the idea that he must succeed early. Consequently, after a year of such labor, the workshop is given up for a college course. The college training means more than the student gets from the text-books; it gives one a mental discipline which enables one to think methodically and express himself in a concise and lucid manner—a commendable trait in an electrical engineer. The cost of a college course is the next problem. Perhaps the experience of the writer may help to solve this. The entire expense, including tuition, books, clothes, etc., for each year in one of the great technical schools in the Central States was, respectively, $214, $217, $227 and $300. However, the catalogues of nearly every university give similar estimates. The first vacation was spent in the setting-up department of an engine works as an assistant to a machinist, at $1 a day. The next was occupied in the drafting-room of a manufacturing concern, at $2 per day. During the vacation between the junior and senior years, employment was found in a small electrical manufacturing concern as an all-around man, doing a little drafting and testing, and installing machines. The compensation was $8 per week. If the young man lives in one of the larger cities, where manual training schools are maintained, such a course will shorten his college work one or one and one-half years.

After the college course is complete, if further training is desired, sometimes advantage may be taken of the student courses in some of the large electrical works, as those of the General Electric or Westinghouse. The college graduate fills out a blank, sent by the company upon application, and states what line of work he wishes to pursue. If admitted, the instruction is very thorough, and takes about two years to complete. The compensation is about 8, 10, 12 and 17½ cents per hour for each of the four periods of six months each. Some of the best engineers in the country have taken advantage of this training.

When the college course is ended, the young man need not feel discouraged if he finds he has to start into some menial work, as is nearly always the case. His training will bring him just advancement, and, after some years of experience and hard work, he may feel that he has earned the suffix "Electrical Engineer" to his name.

*Third prize contribution. See ELECTRICAL REVIEW, December 8, 1897, p. 276.

ROENTGEN-RAY NOTES.

BY WILLIAM ROLLINS.

VII—OTHER REASONS WHY THE VACUUM RISES.

If we have a tube with two fixed terminals, a movable platinum target, which is not cooled, and is placed as nearly as possible at the apex of the cathode discharge, we shall in time raise the vacuum, if we send sufficient force through the tube. If we study the appearance of the target, we shall see that molecules of aluminum from the cathode driven against it are so heated as to combine with the oxygen of the residual gases. One way to prevent this is to have only inert gas in the tube, another to cool the target, and there are times when it is best to cool the cathode.

Another reason why the vacuum rises has been pointed out to me by Mr. Kirmayer. Sometimes the glass wrapping of the platinum wire supporting the anode gets cracked. This does no harm until the tube is reversed. Then a spark forms and the vacuum rapidly rises. I have not definitely determined the cause, but until further investigations consider it one of combustion.

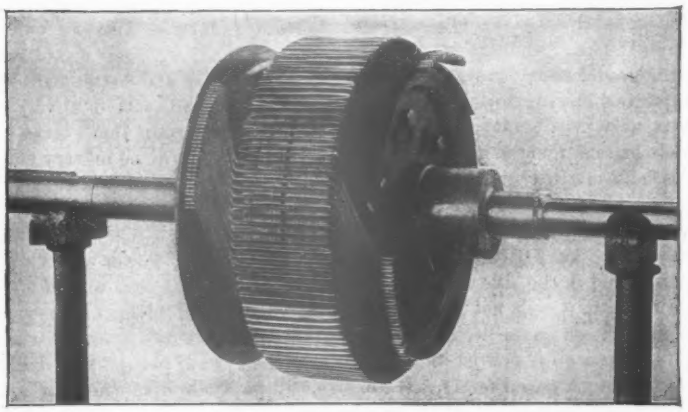

FIG. 2.—ARMATURE CORE FOR 110-KILOWATT GENERAL ELECTRIC BELT-DRIVEN RAILWAY GENERATOR, SHOWING COILS AS PLACED ON THE CORE.

VIII—WHY THE DEFINITION OF A REFLECTING FOCUS TUBE IS BETTER IN ONE PLANE THAN ANOTHER.

If we study the target mentioned we shall see that the roughness caused by the cathode discharge has an oval figure. However perfectly we grind the curvature of the cathode, mechanical and other reasons prevent us from bringing the discharge to a point. Moreover as the surface of the anode is at an angle of 45 degrees there must always be part of its surface where some of the rays strike either before or after they come to a focus. Therefore for the best definition the surface of the target should not be at an angle of 45 degrees. And the double focus tube which has two reflecting surfaces, both of which can be cooled in the way previously shown, is to be avoided as the definition is always bad. In practical work we should be careful to so place the tube in relation to the patient as to see the oval figure at such an angle as to reduce its length. If we make the surface of the target at right angles with the cathode discharge this strikes a fairer blow and such a tube is very bright, though it has serious objections, because the available field is annular on account of the cathode shadow. Nor does an annular cathode overcome the difficulty, partly because this form of cathode does not bring the discharge to as good a focus, and partly because when the Roentgen rays are sent back in the direction of the cathode there is less light.

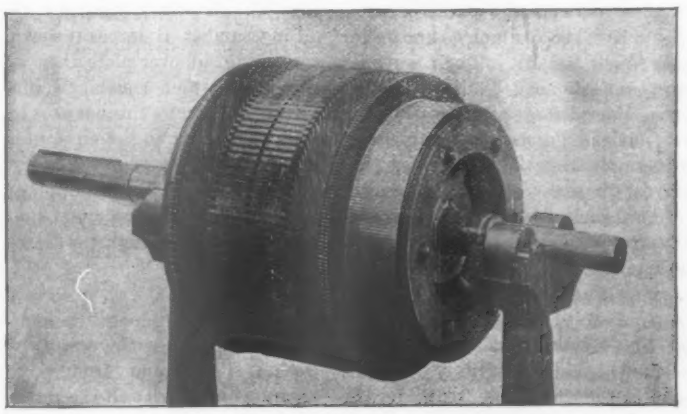

FIG. 3.—ARMATURE CORE FOR 110-KILOWATT GENERAL ELECTRIC BELT-DRIVEN RAILWAY GENERATOR, READY FOR BINDING.

IX—DIRECT-ACTING, NON-REFLECTING FOCUS TUBES.

Roentgen's reflecting platinum anode tube in some of its modified forms is now practically the only type used, because it gives so much light, but the older type—where the cathode discharge, sent forward to the wall of the tube, there producing Roentgen rays, which are transmitted in the same direction instead of being reflected—has always had a fascination for me because when I look with the eye of the mind at what takes place in such a tube, I see a more symmetrical movement in the molecules of the residual gases than is possible in the reflecting type. If, however, we try to get good definition by focussing the cathode discharge upon the glass it is at once destroyed nor will cooling preserve it, so in their present form such tubes are not practical. In Note 6 I mentioned that with powerful generators platinum would be permeable, and spoke of a tube with a cooled platinum disk forming that part of the wall on which the cathode discharge was focussed. Meanwhile, for ordinary generators and potentials producing the rays of such wave length as we want to distinguish markedly between certain tissues of the body, we can make an opening in this platinum disk and close it with beryllium, which having an atomic weight of nine, one-third that of aluminum, is transparent and at the same time makes a good target on which to receive the focus of the cathode discharge and as a window for the Roentgen rays to come through. There are mechanical details in this tube which, requiring woodcuts to illustrate them, will be described more fully in a subsequent note.

CHAUNCEY M. DEPEW'S MISSED OPPORTUNITY.

HOW HE CAME TO ESCAPE BEING THE OWNER OF THE TELEPHONE.

In a recent interview with a New York *Tribune* reporter, Hon. Chauncey M. Depew recounts his first acquaintance with the telephone. The question of the death of Mr. Gardiner G. Hubbard brought forth the following interesting reminiscence:

"Thirty years ago I was counsel for the Harlem road, and Gardiner G. Hubbard was railway mail inspector. In the course of our official duties we were thrown frequently into contact, and came to know each other well. I liked him and he seemed to like me. We grew more and more confidential, until one day Hubbard came into my office, and leaning against my desk, said:

"'Depew, I have a son-in-law. He is a bright young fellow named Bell. He is a student, and not very practical in his ideas. He has invented a talking telegraph. It is a wonderful sort of an arrangement. I think it has wonderful possibilities in it for short communication for use in villages and other places, and will save a great deal in messenger-boy fees and so on. I don't think it will ever be of much use for long-distance messages, but it seems as if it might have a field of its own.'

"In those days Hubbard had no money, and I had only a little. He suggested to me that I take an interest in the invention, and made a proposition that I advance $10,000, for which he would give a sixth interest in the patent. I said I would think it over. The next day I went down-town and saw William Orton, who was at that time president of the Western Union Telegraph Company. I laid the matter before him fully. He said to me:

"'Depew, you haven't got much money, and as a friend I don't want to see you lose what you have got. That invention is practically worthless. It will never amount to anything. If it should, however, we own prior patents upon the idea of which Bell's patents are simply an infringement. Don't throw away your money.'

"I took his advice, and now I am in a position to reflect. What would have been the result? I would be to-day, or my estate would be, worth something like $30,000,000. I say my estate, for in the event of my having secured an interest in that tremendously successful company, I do not think I should be alive to-day. Why? Because I would have suddenly grown rich. I would have had, aside from my tremendous holding of stock, an enormous revenue that it would have exhausted me to spend. There would have been no incentive for me to engage in healthy labor and an intellectual work such as I have been compelled to keep at in order to make my way in the world. I attribute my life and my health to continued and healthful labor. Not overwork, or underwork, but just a natural allotment and fair share. Had I received all this income and sudden wealth, there would have been no incentive to work; I should have deteriorated and would to-day, perhaps, be dead, and forgotten as one in life who was practically unknown. The papers would have chronicled the death of a tremendously wealthy holder of telephone stock, and there it would have ended. Things certainly move in a marvelous orbit, and the fine adjustment of lights and shadows, aims, ambitions and human passions is always marvelously well balanced."

New Belt-Driven Railway Generators.

So rapid has been the development of the railway generator directly connected to the driving engine, and so extensive its adaptation, that the railway public is liable to lose sight of the fact that the belt-driven generator is still greatly in demand. Many cases exist in which the conditions do not warrant the installation of direct-connected apparatus, and to these cases the belt-driven generator is more applicable.

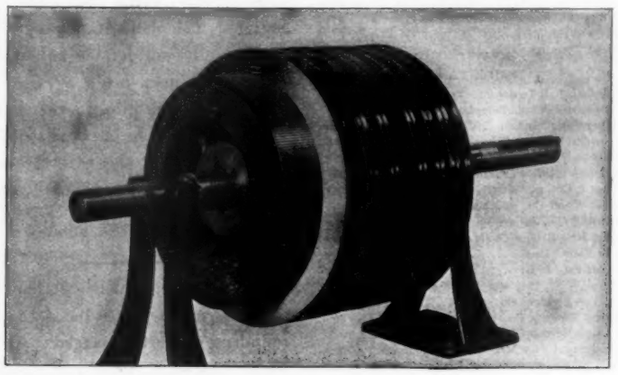

FIG. 4.—ARMATURE CORE FOR 110-KILOWATT GENERAL ELECTRIC BELT-DRIVEN RAILWAY GENERATOR, WITH COMMUTATOR, COMPLETE.

Improvements in belt-driven generators have kept pace with those in all other classes of electrical apparatus, and the distinguishing features of excellence of the General Electric Company's direct-connected apparatus have been incorporated in its new line of belted machines. These are all six-pole generators, built in five sizes, ranging from 110 kilowatts to 500 kilowatts. That shown in the illustration is a 110-kilowatt, six-pole, 500-revolution machine.

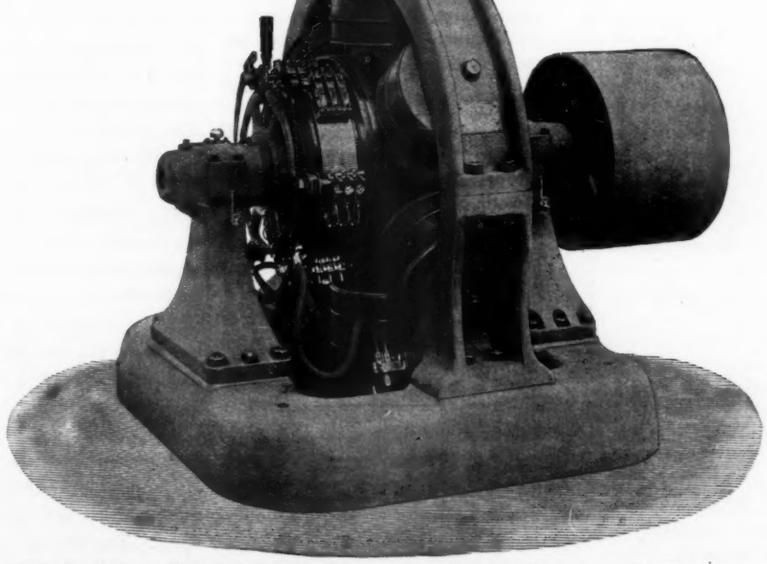

FIG. 5.—GENERAL ELECTRIC COMPANY'S BELT-DRIVEN RAILWAY GENERATOR, 110 KILOWATTS.

The magnet frame is of cast steel, heavily ribbed, making it both light and compact. Its magnetic efficiency is the highest obtainable. The bearings are built upon the ball and socket principle; are self-aligning and self-oiling. The armature shaft has been increased in size and the bearings lengthened, two features substantially guaranteeing cool operation. The steel poles and pole pieces are cast in one piece, and so bolted to the frame that they may be easily removed without disturbing either the armature or the frame.

The series winding of the field coils is of flat copper ribbon, the shunt winding of wire. Instead of winding the series coil on the field spool and covering it with the shunt winding, both windings are placed side by side on the pole and, being entirely independent, either may be removed without disturbing the other. This feature will be readily appreciated when it is compared with the methods heretofore in use. It is no longer necessary with this new method to remove the shunt winding to reach the series winding.

The armature is of the barrel-wound type, such as is used in the General Electric direct-connected generators. This method of winding gives the smallest number of joints, and facilitates any necessary repairs, as few coils need to be removed to reach any particular one incapacitated for service. The cast-iron flange, bolted to the armature spider at each end of the core, forms a support as well as a cylindrical receptacle for the projecting ends of the coils. The coils are secured firmly in the slots of the core, and the cross connections are made on the barrel flange. The projecting ends of the coils in the flange are thoroughly insulated and held in place by steel bands. The flange extension also protects the windings from any oil that may be thrown from the bearings. The surface of the interior of the armature is perfectly smooth, offering no opportunity for the collection of oil or dust.

Ventilation is effected by the use of specially constructed vanes forming air ducts between the laminæ of the core. These convert the armature into a blower, and create a strong draft through the windings. The commutator leads are taken directly from the coil to the segment immediately beneath it. The construction of the commutator is similar to that of the direct-connected machine. It is ventilated by air drawn through the body and discharged through air ducts in the core. The small difference of potential between the segments secures the permanence of the insulation and freedom from sparking.

The strength of the magnetic field in these generators is so proportioned to the armature reaction that a constant brush lead and neutral point are insured even with heavy overloads.

These General Electric belt-driven generators have only recently been introduced, but up to October 1 over 55 machines have been sold, aggregating considerably over 10,000 kilowatts.

A Carbon Battery Suit.

The Phœnix Carbon Manufacturing Company, of St. Louis, has commenced suit against the Globe Carbon Company for alleged infringement of a patent relating to galvanic batteries.

J. M. Seals has entered suit against the Nashville, Tenn., Street Railway to recover $5,000 damages. Seals claims that Conductor Morgan, in the employ of the Nashville Street Railway, attempted to collect fare from him twice, and, on his refusal, assaulted him.

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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, DEC. 29, 1897.

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A HAPPY AND PROSPEROUS NEW YEAR TO ALL!

Why don't we have a Roentgen Society in New York city? They have one in London, and it seems to be doing good work.

It looks now as if Boston might get some sort of rapid transit. The modified lease of the West End Street Railway Company to the Boston Elevated Railroad has been ratified, and it is stated that work on the elevated road will begin as soon as the plans can be approved.

Tests of the Ogden, Utah, long-distance transmission plant have proved it to be a successful installation. Last week 1,000 horse-power of current was transmitted 37 miles without a hitch.

A bright, but unscrupulous, young man in London has hit upon a swindling scheme which has cost the National Telephone Company some money and considerable annoyance. The young man made a false key which admitted him to the public telephones, which he used without paying for the service. He was finally caught, haled to a police court and fined five shillings for petty larceny.

Another acetylene outfit blown to smithereens, men killed and the surrounding property damaged. At this plant they were liquefying acetylene for commercial lighting purposes. Fortunately, the explosion came when a minimum number of lives were in peril. Acetylene, which was promoted as a competitor of the electric light, is certainly getting considerable free advertising. Its record at New Haven, Binghamton and in New Jersey recommends it highly as something of great value as a blasting agent or for explosive fireworks.

This press dispatch is interesting:

ELMIRA, Dec. 23—At 10 o'clock this morning the jury reported a verdict acquitting George Orme of the murder of James Punzo. * * * Punzo was improving a month after the shooting, when the X ray was used to locate the bullet which was in the brain. Death followed, and the defense alleged that the X ray brought about the fatal result.

Did the defense prove its allegation? Apparently it did. Here is a case worthy the closest attention of scientists. If true, this is the first fatality caused by X rays, and the whole matter should be laid bare in detail.

It is in the air that the New Year will be a highly prosperous one. This we here and now predict will be especially true of the electrical industry. In this line, Mr. Geo. A. McKinlock, president of the Central Electric Company, of Chicago—a strongly established house that has very large interests and widely distributed patronage—writes us under date of December 24, as follows: "I am very glad to know that you are a 'bull' on '98. I agree with you that all the signs justify the prediction that it will not only be one of the best business years we have had since '92, but the best. I hope that such will prove to be the case with the ELECTRICAL REVIEW."

With the safety appliances now on the market and available for commercial service, there would seem to be no excuse for "runaway" engines. In a Pittsburgh iron mill an engine recently ran away and killed a man. We are informed that this accident was the third or fourth of the kind that has happened in the same mill, and that any one or all of them could have been prevented by the use of a proper safety device. There are recorded cases of "runaway" engines in electric plants, caused by short circuits and blown fuses. Aside from the commercial economy, assured by avoidance of such accidents, it seems a great deal like criminal carelessness to ignore the means of prevention, so easily obtainable.

The enlarged city of New York, which begins its existence as a community of nearly 3,500,000 souls on January 1, 1898, will be welcomed with proper ceremony on the night of December 31. Through the liberality of Mr. W. R. Hearst and the influence and prompt action of his newspaper, the *New York Journal*, the occasion is to be made a memorable one. The ceremonies will take place at the City Hall and in the City Hall Park. There will be speeches, parades, music on a magnificent scale, and unusual decoration and illumination. The electric light will have a large part to bear. The ELECTRICAL REVIEW congratulates the proprietor of its daily contemporary on the progressive idea that promises to be carried out so liberally and successfully.

The telephone interests of this country have done some very skilful advertising in their time, but we doubt whether any better advertising of this kind has been seen than that now appearing over the name of the New York Telephone Company. In the weekly and daily papers this company's announcements are conspicuous for their terseness, typographical appearance and directness. Many catch phrases are used with telling effect. The best of these, we think, is this: "Don't travel—telephone." There is a good business sermon contained in the idea conveyed by those three words. To the casual observer it might seem odd that a telephone company should advertise at all. But so many improvements in the telephone service of New York city have been made during the past year that it has been necessary, we assume, to keep the public informed. The result must be satisfactory to the company, or the advertisements would not continue to appear.

Wall Street and the Electrical Stock Market.

The fears of higher money, which in turn was to exert a depressing influence upon the general stock market, have not been realized, and with no obstacle in the way of higher prices, the stock market, on a holiday volume of business, has, nevertheless, made a substantial gain in values. Developments in the New York transit situation have been of a character favorable to the existing companies. Manhattan was the leader and advanced substantially on buying of an excellent character. Wall street rumor has it that both insiders of the company and interests identified with the ruling political party have been instrumental in engineering the movement. The substitution of power in the elevated system is expected to result very advantageously to Manhattan, and this, together with talk of possibilities of extensions and of closer relations with the Metropolitan Street Railway Company, have been the favorable arguments. Metropolitan Street Railway has for some time past been a conspicuous feature, every day showing substantial gains and establishing new high records of values for the company's stock. On reports that the difference between the company and the Third Avenue road had been adjusted and that Metropolitan had secured control of what is known as the Huckleberry Traction system, north of the Harlem River, there was good absorption by people who profess to know the possibilities of the company. Third Avenue in a few days advanced more than 20 points.

Another favorable feature contributing to the general strength of the market was the announcement that the anthracite coal trade was the subject of discussion by Mr. Morgan and other powerful interests, which would result in developments precluding a repetition of the mistakes of the past.

Western Union advanced sharply on Friday. I am told that there has been a quiet but steady absorption of this stock recently by a prominent interest, and that a sharp upward movement may be looked for before many days. The Western Union Telegraph Company has asked the Federal Court, at Omaha, for further time in segregating its line from Union Pacific property. It alleges that the real purchasers of Union Pacific are not yet known, as the purchasing committee is alone the responsible head, and the new management will remain a mystery until Kansas Pacific has been disposed of. Three months' time is asked. General Electric ruled quiet but steady throughout the week. The patents granted to Rudolph M. Hunter, assignor to the General Electric Company, are on the transmission of electrical energy. As is well known, Mr. Hunter is under contract, by which he turns all his patents over to the General Electric Company. A decision in the car controller and carbon commutator brush cases is expected at any moment now, and will be of great importance to the company. An insider informs me that there has never before been so much business in sight as there is to-day for the company. Unless altogether unforeseen and improbable contingencies arise, 1898 will be a remarkable year for the company.

During the week the following quarterly dividends were declared: Mexican Telegraph Company, 2½ per cent, payable January 13, books closing December 31 and open January 14; Central & South American, 1½ per cent, payable January 6, books closing December 24 and reopening January 7; Edison Electric Illuminating of New York, 1½ per cent, payable February 1, and Westinghouse Electric and Manufacturing Company, 1¾ per cent on the preferred stock, payable January 3. Books close December 27 and reopen January 4. BAIN.

Wall street, December 24.

The Brush Multi-Circuit Dynamos.

The advantages of the Brush multi-circuit arc dynamos are rapidly being recognized by the central station lighting companies of the country. In the use of this modern machine two or more circuits run direct from one dynamo with any distribution of load on the different circuits. The newly designed Brush dynamos are made in capacities of from 55 to 300 2,000-candle-power lights and from 45 to 160 1,200-candle-power lights. By these dynamos are secured flexibility in handling circuits, reduction of high voltages on circuits run from large dynamos, large units with increase of efficiency, and saving of floor space, attendance and shafting.

The new station of the United States Lighting Company at Washington, D. C., where every feature is of the most modern character, is equipped with a large number of these improved machines, and a large number of them are to be used in the extensive new station now being constructed in Brooklyn. Among the many other stations using the improved Brush dynamo are those at Newark, Brooklyn Municipal, Cleveland, Philadelphia Northern and Philadelphia Brush, Worcester, Toronto, Erie and Chicago.

An Illuminated Key-Hole.

A bright western genius has invented an illuminated key-hole which promises to be of great value to that class of citizens who keep late hours at the club or who are frequently obliged "to sit up with a sick friend." The inventor has devised a lock with an adjacent receptacle which contains a miniature incandescent lamp that is so placed as to cast its rays upon the key-hole. This is all right as far as it goes; but the genius should work his brain a little overtime and "get up some rig," as Mr. Edison says, to prevent the wanderer from seeing more than one key-hole.

The Roentgen Society of London.

The first ordinary general meeting of the Roentgen Society was held at the Medical Society's rooms on December 7, under the presidency of Dr. Gladstone, says the London *Electrical Review*. A paper was read by Mr. A. A. C. Swinton, on "Adjustable X-Ray Tubes." The tubes described by Mr. Swinton were mostly those which he has designed himself. The quality of the X rays issuing from these tubes can be modified by the simple expedient of moving either the anti-cathode or the cathode. The former method has the disadvantage that the point of emission is not fixed, and on the whole Mr. Swinton seems to prefer the adjustment of the cathode disk, though this method is accompanied with some loss of energy from the back of the cathode disk. Another improvement in Mr. Swinton's tubes is that the platinum anti-cathode is kept cool by being fixed in contact with a block of aluminum. It has been found that large currents must be used to get the best Roentgen effects, and, when such is the case, the platinum anti-cathode may be fused if some artificial means of keeping it cool is not employed. Mr. Swinton suggested that it might be found worth while to devise a system of cold water circulation for the anti-cathode. The objection to the heating of the platinum is that it blackens the tube and absorbs the residual gas.

Dr. Dawson Turner has designed a tube, which is made by Griffin, in which the cathode is adjusted by an external magnet acting on a piece of iron fixed on the cathode stem inside the tube.

Mr. Swinton pointed out that experience had shown that there was no advantage in using very large cathode disks. The size should depend, to a certain extent, on the size of the induction coil used—being larger when the coil is larger. For ordinary use, disks of about one and one-eighth-inch diameter and three-quarter-inch radius of curvature were best.

For the best X-ray work, it was necessary that tubes of the best workmanship, such as those made by Watson and Cossar, should be used. The glass should be the thinnest that will stand the atmospheric pressure, and the cathode disk should be turned in a lathe.

Several interesting points were raised in the discussion on Mr. Swinton's paper. Mr. Noble wanted to know whether the phosphorescent screen or the photographic plate was the best method of detecting and measuring the quality of the rays emitted by a tube. He had found that there was no kind of correspondence between the indications obtained by the two methods. Mr. Swinton appears to agree that the photographic quality of the rays could not be determined by means of the screen. There appears to be an opening for a good X-ray photometer.

On the question being raised as to whether the coil or the influence machine was the better exciter of the X-ray tube, Mr. Wimshurst declared emphatically for the Wimshurst machine. None of the other speakers who had tried the Wimshurst machine had obtained such good results as Mr. Wimshurst, except that they had all found that the image was steadier on the phosphorescent screen than with the coil.

Mr. Swinton explained this by assuming that the electric oscillations were more rapid from the Wimshurst machine. Mr. Wimshurst said that with his machine he had sent a discharge through a tube which had ceased to act with an 18-inch coil. That there is something anomalous in the action of the Wimshurst machine is indicated by the fact that the Swinton tubes do not adjust with this machine as with the coil. It is surprising that nobody in this country appears to have tried the Holtz or the Töpler machine. They give much stronger currents than the Wimshurst machine, and ought, therefore, to give shorter photographic exposures. But all influence machines are enormously behind coils in current strength. The Roentgen Society is to be congratulated on the good start it has made with serious work.

Deflection of the Magnetic Needle.

A cable dispatch to the New York *Sun*, from Moscow, reads as follows:

Experiments that have been made by Russian and French savants in connection with the remarkable deflection of the magnetic needle over an immense area in central Russia have given curious results.

The observations were confined to the strip of country between Moscow and Kharkov, a distance of about 850 miles. The needle showed the greatest aberrations in the province of Kursk, where in the north it was deflected 20 degrees. One hundred and fifty miles southeastward the deflection exceeded 96 degrees, the needle pointing east and west, instead of north and south.

Engineers who are engaged building railroads in that part of the country are much interested in the experiments. They speculate as to how the magnetization will affect the durability of the rails.

It is known that rails are usually more durable when laid north and south than in other directions, the greatest wear from magnetism being when they are laid due east and west.

Why are we not hearing so much as usual about compressed air traction nowadays, especially as concerns New York city? Can it be possible that the Hon. Wm. C. Whitney knew what he was talking about, more than a year ago, when he told the ELECTRICAL REVIEW that the Metropolitan Street Railway Company would not adopt the compressed air system?

Why is it that the artists employed by the illustrated papers never seem to be able to draw a presentable picture of a telephone or phonograph? These important pieces of apparatus have been pictorially libeled for years.

SPARKING, ITS CAUSE AND EFFECTS.*

BY THORBURN REID.

(Concluded from page 304.)

The problem that the designer of the modern machine has before him is to design a machine that will run from no load to 25 per cent above full load without sparking, and without movement of the brushes.

In the case of machines intended for lighting, the condition of no shifting of the brushes is not generally required, but most of our modern lighting machines are made to fill that requirement.

The current to be reversed therefore varies from the exciting current of the machine up to 25 per cent above its full load current. The inductance E and the CR drop in the coil also vary in this proportion, and for perfect commutation through all these varying loads, it would be necessary for the reversal E also to vary in the same proportion. As a matter of fact, the reversal E does not vary in anything like the same proportion, and may even decrease with increase of load, on account of distortion of the flux coming from the field by the armature ampere turns.

Perfect commutation for any particular position of the brushes can therefore only take place at one value of the load. At heavier loads than this critical one, the current is not completely reversed before the segment leaves the brush, and at lighter loads it is more than reversed. This problem may be stated a little more precisely in the following manner:

Assume that the brushes are set as far back as is consistent with sparkless running at the maximum load at which the machine is required to run sparklessly. This means that the reversal E is just equal to the coil impedance E at that point. Now let the load be removed gradually. The impedance E of the coil under commutation is reduced, while the reversal E remains practically constant. The tendency is therefore for the current to be more than reversed, and this tendency increases as the load is reduced, until finally, when the load has been removed entirely, there is no current to reverse, and the reversal E simply tends to produce a current in the coil under commutation. The production of this current is now opposed by the inductance and resistance of the coil, and by the resistance of the brush contact surfaces, the contact surfaces of the two segments being in series as regards this current. If the impedance of the coil is low as compared with this contact resistance, the reversal E would be small compared with the CR drop across the contact surfaces at full-load current. Therefore the current produced by the reversal E would be small as compared with the full-load current.

We may also note here that, whereas the variation of the contact resistances aids the reversal of the current, as soon as this current becomes greater than that which flows through the armature, the excess current must pass across the contact areas of both the segments under the brush. The resistances of these two surfaces are then placed in series as regards this current, and the lowest possible resistance that these could have would be reached when the brush covers an equal surface on each segment, making the contact resistance in the path of this current equal to twice the resistance of the contact surface of either segment at that time. The resistance of this path then starts at infinity, decreases to this minimum, and goes back to infinity again.

Now examine more closely the order of events in commutation at no load. The resistance of the coil circuit first starts at infinity and rapidly decreases, while the reversal E starts at a minimum and more slowly increases. As soon as a current commences to flow, inductance T enters the problem. If there were no contact resistance, the current would reach its normal full load value at about the middle of the commutation period. This, of course, assumes that the reversal E is of such a magnitude as to reverse the current at full load without the aid of the varying contact resistances. In fact, the reversal E does a very small part of the reversing at full load when the inductance is small compared with the contact resistances. The current at the middle of the commutation period would, therefore, be much smaller than the normal full-load current, even if there were no contact resistance to limit it. Now, introducing this contact resistance, which starts at infinity and decreases to a minimum, which may be several times greater than the impedance of the coil, the current must be reduced, at least, in the proportion of the impedance to this minimum resistance. During the rest of that period the resistance is increasing, till at the end it has reached infinity again. The current, already very small, is rapidly cut down, till it is too small to produce a visible spark at the break, and the commutator has not been heated up enough at any point to produce arcing.

The same principles hold in the case of machines whose brushes must be shifted, the range of sparkless commutation only being less.

There have been some machines, however, which would not run sparklessly for any position of the brushes. This is readily explained on the hypothesis of too high an impedance, for in that case the variation of the current during commutation will be mainly governed by the impedance and reversal E, instead of by the variation of the contact resistances, so that even if complete reversal is exactly attained, the current density at other parts of the commutation period does not remain constant, with the result that the total energy of commutation is increased. A large part of this energy is concentrated at the beginning and end of the commutation period, thus producing heating at the edges of the segments with its corresponding melting of the copper and arcing.

These considerations indicate two ways by which sparkless commutation may be assured. First by increasing the brush contact resistance, and second by decreasing the impedance of the coil under commutation.

The limitation of the second of these conditions is merely one of economical design, lowering of the inductive below a certain point increasing the cost of the machine.

The limitation of the first condition is that of rise of temperature of the commutator. It has been shown that for perfect commutation the current density is constant and uniform throughout the whole period of commutation. Its value is found by dividing the total brush current by the contact area of the segments under a brush. This varies inversely with the brush contact area, and the energy developed, therefore, varies in the same proportion. The amount of commutator metal to be heated, as well as the radiating surface, also varies inversely with the current density, so that the rise of temperature probably varies nearly as the square of the current density, provided the commutation be practically perfect.

The increasing use of the carbon brush in place of the copper brush is thus explained by the fact that the contact resistance of carbon on copper, per square inch, is much greater than that of copper on copper. Increased resistance is obtained with the copper brush by reducing its contact area, but this also reduces the metal to be heated in the commutator, as well as its radiating surface, so that the same amount of commutating energy will result in a much greater rise of temperature.

By taking these facts into consideration, however, and properly proportioning the contact areas and inductance, commutating machines may be designed to run as cool with copper brushes as with carbon, wherever this may be desirable.

The reasoning so far has been based on the assumption of but one coil being commutated at a time. This assumption will only be true when the brush thickness is equal to, or less than, the width of one segment, plus twice the thickness of the insulation between segments. In practice, brushes are often made to cover a segment and a half, sometimes two segments or even more than this without deleterious sparking. This means that the current in two or more coils is being commutated at the same time.

At first sight this appears to be an advantage, since it enables us to get the same current density with less length of commutator, but the time of commutation is increased, so that, while the rate of development of energy is not changed, the total amount of energy developed will vary with the time of commutation, and, in addition to this, the amount of metal to be heated and the radiating surface are both decreased, so that, in this respect, the change is rather a disadvantage than an advantage. Another important advantage is gained, however, in that the increase in the length of the commutation period decreases the reactance of the coil by decreasing its frequency of commutation, so that the ratio of impedance to contact resistance is decreased, thus tending towards more perfect commutation. This advantage is again limited by the fact that the mutual inductance of two coils commutating at the same time increases the reaction of both.

To sum up, the deleterious effects of sparking are due to excessive local heating of the commutator contact surface, causing the copper to melt, and an arc to be drawn, the segments being thus disintegrated.

The causes of deleterious sparking are either too great a departure from perfect commutation, or too high a current density.

Perfect commutation can only be practically secured by making the impedance of the coil negligible as compared with the contact resistance. A comparison of the sparking constants of a large number of machines was made before this theory of commutation was evolved.

It has been found to explain many cases of sparking, which had before been unexplained.

It has been found difficult to determine definite safe working constants, on account of the small number of tests that have been made to determine accurately the inductance of the coil under commutation, and the effect on each other of the two or more coils commutating at the same time.

*Read before the American Institute of Electrical Engineers, New York, December 15, 1897.

ELECTRIC TRACTION.*

BY CLOYD MARSHALL.

Electric traction is now and has been for some years the foremost branch of electrical industry in the United States, and present indications point to its growing importance. Already there are 13,765 miles of electric lines, and the capital invested has reached the great sum of $846,130,000. Nearly every city and village in the country is provided with electric cars, but from now on the development will be in the more important field of heavy traffic. By this term is meant the conditions of service on the elevated and underground roads, the interurban lines and the systems operated under steam road conditions. The elevated service has a very limited application only in the largest cities, but on these lines the solution of some of the problems there being worked out will be of material assistance on the surface lines. It has been found that electricity is much more economical and satisfactory than steam in such work. The Metropolitan and Lake Street elevated lines in Chicago and the Liverpool overhead road have demonstrated this point. The equipments are all very similar, except that gearless motors are used at Liverpool.

One notable departure in elevated road practice is the adoption of the Sprague system by the South Side Elevated Railroad Company, of Chicago, which now uses small steam locomotives in operating its cars. There are a number of new ideas embodied in the apparatus and its arrangement on this system. Each car is equipped as a complete motor car, having a motor on each truck, a controlling mechanism and an air compressor automatically operated by a small motor. The feature which stamps originality on the system is the possibility of joining any number of these cars together, each doing its own part of the work in propelling the train. The controlling mechanism can be governed from any vestibule on the train, and all parts act in synchronism.

The advantages of such an arrangement are apparent. Trains of any length can be run with the motors always working at an economical point regardless of the number of cars. Cars can be put on or taken off at times of heavy or light service, and at convenient places, for changes can be quickly made. The power for acceleration, which is so greatly important in elevated road service, is greater with this system than with any other, for the weight of each car and its load is available for tractive effort. These advantages have been secured at the price of complication, and in multiplying the number of pieces of automatic mechanism the chances of breakdown and cost of maintenance are increased. The use of small motors will not make a marked difference in the current demand, for the difference in efficiency between a 50-horse-power motor and a 200-horse-power motor would be little more than two or three per cent. However, the cost of power is not such a great factor on elevated roads as on surface lines.

To test the real merits of the system it will have to be subjected to actual service for a considerable period and records compared. Even

*Read before the Chicago Electrical Association, December 3, 1897.

though it may be more expensive, the flexibility, convenience and higher average speed of the Sprague system might so commend it to the public as to greatly increase the patronage of the road. If it is a success it will be a great one, and its adoption by the other elevated companies will be only a question of time.

Electric traction is now passing through an evolution, and it is difficult to tell where the limitations will be. The short lines in the cities have been extended into the suburban districts, and now connecting roads are being constructed to unite the systems of neighboring towns. The Cleveland suburban and interurban lines are examples of such extension; five lines run from the public square to cities 20 to 38 miles distant. The steam roads are fighting these lines by making nominal rates, but the clean and frequent service of the electric cars more than compensates for everything else.

The apparatus and equipment for electric traction have so far been designed to replace horse-power and for the comparatively short lines in the cities. For interurban service, where higher speed and more power are required, the motors have been enlarged, the car bodies strengthened and the double trucks adopted. With plans for the long lines between cities, and high speeds in competition with the steam roads, it is evident some more important changes are needed, and the apparatus should be designed to conform with steam road engineering. The conditions of such service are very exacting on the equipment.

The first question is, Can the electric lines compete with the steam roads? It has been the experience near Cleveland, Boston, Hartford and Minneapolis that the trolley roads parallel to the railroads get the lion's share of the traffic, and this in spite of the slower speed. The success lies in that the intervals between the trolley trains are short, the schedule is unvarying, the cars are clean, cool in Summer, warm and well lighted in Winter, and stop at convenient points. Most of the interurbans are carrying mail, small packages and express matter, and this affords a considerable source of income. Of course the steam roads do not want the expense of adopting electric traction, but if the business turns to the more convenient, cheaper and popular trolley car, something must be done.

One after another the equipment questions are being solved. There is no longer a doubt but that the electric motor can perform the work of the locomotive. It can climb steeper grades, the absence of reciprocating parts makes a greater speed possible, and the fact that the source of power is external enables it to have a greater capacity and pull heavier loads. The motor does not require skilled labor for handling and repairs, so that the personal factor in the steam engine is much greater than with the motor. Greater acceleration can be attained with the motor; such results as were obtained at Schenectady were never dreamed of with the locomotive. The smoother running of the motor is easier on the track and all equipment. One other difficulty with the locomotive is that units of motive power are not available for all kinds of work. Sometimes locomotives are used in passenger service which requires one-half, one-quarter or one-tenth of its power. The steam motor car recently built at the Schenectady locomotive works is evidence of the fact that such small units are needed in steam road work.

Now as to the coal bill; with the electric line the energy is generated in the most economical manner, while each locomotive is a little generating plant of itself. With express locomotives operating under favorable conditions, the coal consumption is about four pounds per horse-power per hour. One of the New York Central express engines made a record of three and one-half pounds; for local traffic five pounds is a good average, and for freight, six to ten pounds is the usual consumption without considering the coal consumed in starting, banking and drawing the fires. With large stationary engines a horse-power can be generated with two pounds of coal; some, under very favorable conditions, take but 1.5 pounds. Coal consumed in the power-house is very much less expensive in first cost and handling than that on the locomotive. One of the large mills in New England reported the yearly cost per horse-power to be $11.64, and the manager of the General Electric Company, Limited, stated in an English paper that the cost per horse-power per annum of running a 600-horse-power compound condensing engine at the Peel Works was as follows, with coal at $1.68 per ton:

Coal	$4 76
Labor	2 34
Oil and supplies	1 42
Repairs	12
Total	$8 64

Such figures as these, of course, are not realized in street railway stations, but they show what can be done. The *Street Railway Review* has been collecting some data on the cost of power-house operation, and from the figures I find that the average for 10 of the principal street railways of the United States is .885 cent per kilowatt hour, or $20.54 per horse-power for 310 days of 10 hours each, or $43.62, 365 days. 18 hours. This includes fuel, labor, supplies and repairs, but not interest and depreciation. The fuel bill ranges from 36 to 73 per cent, the average being 54.1 per cent of the power-house operating expenses. As a rule, the cost of fuel for an electric system is about five per cent of the operating expense, while on steam roads it is 10 per cent. Whenever water-power can be utilized, or the power station located near coal mines or culm heaps in generating power, the electric lines then possess very great advantages over the steam roads.

A study of the question will reveal the facts that for electric lines the power can be generated and applied more economically than on steam roads; it is the economic transmission of the energy which is the difficult problem. Some writers on electric traction have neglected to fully consider these difficulties and have reached impractical conclusions. As far as an engineer can see into the future, it is improbable that electricity will supplant steam for general railroading purposes, but there are some departments of the work where the adoption of electricity will be a great advancement. In thickly settled communities, as parts of the New England, North Atlantic and Central states, the railroads will be forced to make changes in their service to successfully compete with the parallel trolley lines. If the example of the New York, New Haven & Hartford Railroad Company is followed, this can be done. Service on a private right of way enables high-speed service to be given faster than would be permissible on the public highways. Colonel Heft states that in consequence of this change the traffic between Berlin and Hartford has increased 400 per cent since the opening of the line. It is the old story of better, although costlier, service, being more popular and profitable. It is cheaper to travel by canal than on the railroads, but we can hardly consider the canal a competitor of the latter.

Although the railroad papers are persistent in decrying the usefulness and adaptability of electricity to steam railroads, under any conditions, yet it is significant that they devote much space to the subject, and many of the leading railroad engineers are making a careful study of it. The Illinois Central was instrumental in having the Schenectady acceleration tests made, which were so remarkable in their results. The engineers of the Chicago & Northwestern and the Chicago, Milwaukee & St. Paul were present, and admit that they are getting posted on electric traction. In personal interviews they disclaim any intentions of their companies adopting electric traction, yet they say under some conditions it would be advantageous to do so.

It seems that the day is near at hand when the electric locomotive will find wide application within the limits of the great cities, and the steam locomotives will be outlawed. At present each railroad track is an unclean strip through the city, and the smoke, soot and dust make contiguous property undesirable. As a result the railroad routes are lined with huts, hovels and tumble-down warehouses. The handsome and costly stations erected by the companies are begrimed and soon rendered unsightly. For public health and the improvement of the city the presence of the locomotive within the city limits should be prohibited. The adoption of the electric locomotive from the limits to the stations would do away with the smoke and filth, and enhance the value of the property along the railroad tracks. The railroad men would raise a cry about the dangers of the third rail and the complications at switching points. The same objections, with greater force, have been raised against the use of the trolley in the streets, and the Union Loop and the South Side Elevated, at its yards in Chicago, have succeeded in operating some complicated third-rail work.

For high-speed work the trolley is not suited, the danger limit being about 40 miles an hour, although some experiments have exceeded that figure. One of the large electric companies spent much time and money experimenting on a small Pennsylvania road, and some record tests were made with the trolley. High speed was made for a considerable distance, one mile being covered in 57 seconds, but the trolley wheel jumped the wire, tore down the line and broke off several poles at the ground; also the top of the car was damaged. It is obvious that the trolley will not do for this work, and we must turn to the third rail. Fortunately, the third rail for railroad work costs about half as much as the trolley. It should be protected in some way, so that any one crossing or working on the tracks will not be subjected to danger, and tools and bars will not short circuit the section by careless handling. Such a system is on the market, though it has hardly passed the experimental stage. Another system which might be worked out would be to have the rail sectioned, in lengths of 3,000 feet, more or less, as convenient, and energized like the underground magnetic system.

With the present equipment it seems that 500 or 600 volts at most is the limitation of the direct-current motor, and long lines can only be operated by placing power stations at frequent intervals, say 10 or 12 miles apart. The transmission at this voltage involves enormous losses or great expense for copper. On one road recently tested the voltage varied from 525 volts near the station to 240 volts at the end of a line seven miles distant. It is obvious that for transmission alternating currents must be employed. How necessary high voltages are may be seen from a little calculation on the cost of copper for line wire. Mr. Stillwell gives the cost of copper required to deliver one horse-power at motor shaft 10 miles from the generator, allowing a 20 per cent drop and copper 15 cents per pound at 500 volts, $780.75, and at 10,000 volts, $1.95. Thus, it is seen that it costs 400 times as much to furnish copper at 500 volts as it does at 10,000. A voltage of 10,000 is well within present engineering practice.

With apparatus in the present state of development the best plan is to generate an alternating current at the place of most favorable conditions, and transmit at high voltages to substations where rotary converters will change it to a direct current and supply sections of line of medium length. It is generally believed that alternating-current motors are out of consideration for traction purposes, and it is true that the experiments have not been successful, on account of the low starting torque and lack of regulation, but the improvements which have of late been made go far in perfecting this machine. As an example of what can be done, reference is made to the 400-horse-power two-phase induction motor, installed by the Westinghouse company at the station of the Buffalo & Niagara Falls Light and Power Company. These machines require practically no attention, having no commutator, collector rings, brushes or any sliding contacts.

The speed of multiphase motors may be regulated by changing the number of excited poles, the speed being inversely proportional to the number of pairs of poles; also resistance in the armature circuit will have the same effect. In some recent experiments in Germany, it was reported that a single-phase motor, with auxiliary coils of a few turns causing a phase shifting, gave a starting torque two and a half times the normal in the short-circuited armature parallel to the exciting coils. Otherwise the machine was the same as the ordinary single-phase motor and no starting resistance was necessary in the main circuit. Of course this starting torque is not so great as that obtained with the series motor, but the experimenter stated that it could be increased. It is desirable to transmit a single-phase current on one wire and use a phase shifting or splitting device on the car. If the third rail construction is adopted a fourth rail would not be objectionable, as is the second trolley wire, and a polyphase motor can be used. There are many advantages and much economy in the use of alternating currents and their utilization for railway work depends on the designs of the motors.

The application of electricity to heavy traction promises to be its greatest field, and as the past year has been fruitful in some striking and successful examples, the coming year will solve many important problems in this line.

Middletown Springs, Poultney, Fair Haven, Hydeville, Castleton and Rutland, Vt., are to have an electric railway. A company has been organized with the following officers: President, J. S. Pearson, of Burlington; vice-president, F. C. Kennedy, of Burlington; treasurer, J. J. Flynn, of Burlington; directors, A. Y. Gray, of Middletown Springs, J. S. Pearson, J. J. Flynn and F. C. Kennedy, of Burlington, and Edward Hatch, of New York city.

WESTERN NOTES.

Mr. Charles Wirt last week returned to Philadelphia, after an extensive trip through the West in the interest of his non-sparking brush and other specialties.

Mr. E. J. Bagnall, of the Adams-Bagnall Electric Company, Cleveland, came to the city a few days ago, took a run up to Milwaukee, and returned to Cleveland to be in time for the holidays.

Wm. H. Holcomb, of Chicago, is at the head of a company just incorporated at Indianapolis for the purpose of building an electric road connecting Goshen and Elkhart, Ind., and Lake Wawusco.

Wm. Wright, Monadnock Block, Chicago, although established but a short time ago is already enjoying a profitable trade in the products of the E. S. Bernard Company and the "Mayo" alternators, for which he is selling agent. In addition Mr. Wright carries a large and varied stock of generators, motors, engines and boilers that have been used, but are always thoroughly overhauled and repaired, when necessary, before shipment.

The necessary prerequisite of a successful advertisement is, above all, attractiveness. The line of advertising for some time past carried out by the Central Electric Company shows this quality in a marked degree; and that is no doubt one of the reasons why that company's advertising has been and is so profitable. Another reason is that the announcements made by the company always have that honest ring to them, the absence of which so easily proclaims the spurious coin.

When our genial friend, Jas. H. McGill, returns from a little trip to Valparaiso, Ind., where he went "to get a Christmas present," as his friends were informed, he will be accompanied by one of that city's fairest daughters, who, up to the 23d instant, was Miss Fanny Ruth Skinner. Owing to pressure of business of the groom any extended wedding trip will be postponed until cold Winter has taken flight, the happy couple in the meantime settling down in their cosy home in Chicago. The REVIEW extends hearty congratulations, and hopes that the coming years may be their happiest.

Comptroller Waller, on the 23d instant, opened the bids for engines, boilers, dynamos, lamps and material to be used in the extension of the city's lighting plant, for which $150,000 was set aside by the council last October. Somewhat of a stir was caused when a letter to the comptroller, from some engine firm, was read, asserting that the specification for boilers were drawn in the interest of the Heine Boiler Company, and that it was practically impossible for any other maker to comply strictly with the specifications. Besides the Heine company only one other bid for boilers was received, and that from the Aultman-Taylor Company, who stated that it could not furnish boilers exactly as specified. The comptroller stated that inasmuch as the Heine company was the highest bidder, there seemed to be some truth in the above statements, and then invited those present to make any comments. Chas. E. Gregory, who had submitted a bid for 1,100 "Standard" arc lamps, at $10 each, stated that, as far as the lamps were concerned, the specifications were all right, even if they did call for single side-arm lamps, which were only made by the Adams-Bagnall and Western Electric companies, and that he could furnish such lamps, but for the fact that the time limit, 90 days, was entirely too short to make 1,100 special lamps. Mr. Buell stated that the Adams-Bagnall Company had not even bid, when Mr. J. G. Pomeroy, of that company, explained that their standard lamp was made with a cast-iron case, guaranteed for 15 years, while the specifications called for copper cases, hence his company preferred not to bid. After considerable more talk, the comptroller announced that he would decide the matter the next day. There is likely to be more or less trouble before the bids are finally accepted, as some citizens have applied for an injunction, restraining the city from using the amount of money called for, claiming that it is not available. The court will pass upon the application on the 24th instant. In all probability, new specifications will be given out and new bids advertised for. C. E. K.

Chicago, Dec. 24.

Commercial Wireless Telegraphy.

The United States Electrical Supply Company, of 120 Liberty street, New York city, are about to introduce an apparatus for wireless telegraphy. The construction of the instrument in many ways is similar to that employed by Marconi in his experiments, by which, by the use of the Hertzian waves, a message can be transmitted through almost any obstruction.

Mr. W. J. Clarke, general manager of the company, gave a very successful exhibition of the uses of the instrument before the American Institute of Electrical Engineers on December 15. He showed in the experiment that a message could be accurately transmitted from one room to another through two closed doors.

He has done away with the reflectors used by Marconi for his air circuits, holding that they have no material influence in the transmission of the electrical current.

Mr. Clarke also claims that by means of the improvements made in the new machine over that of Marconi's, a message can be accurately sent to the distance of 10 miles.

Several changes have been made in the instruments with the view of condensing them into such a shape as may be more convenient for commercial purposes.

Mr. Chas. P. Geddes was elected assistant treasurer of the Sprague Electric Company last week. Mr. Geddes was formerly treasurer of the Interior Conduit and Insulation Company, and, as the active financial man in the new Sprague company, is the right man in just the right place.

Northwestern Electrical Association.

The sixth annual convention of the Northwestern Electrical Association will be held at the Hotel Pfister, Milwaukee, commencing on Wednesday morning, January 19, next. All interested in electrical matters, whether members or not, are cordially invited. Arrangements made with the new management of the "Pfister" insure perfect satisfaction to all members and visitors. Direct and alternating current will be provided for exhibits. One and one-third railroad rate can be secured, conditioned upon 100 certificates of attendance. Mr. Frank L. Perry, 510 Marquette Building, Chicago, will have charge of transportation of delegates coming from or through Chicago. Papers on "Practice of Theory," "Present Efficiency of Incandescent Lamps," "Notes on Municipal Ownership," "Physical and Chemical Properties of Volatile Oils in Boilers," "Electric Lighting for Profit," "Long-Distance Transmission" and "Transformers" will be presented by John C. McMynn, of Illinois; John E. Randall, of Missouri; Fred DeLand, of Illinois; Wm. H. Edgar, of Illinois; Alex Dow, of Michigan; Axel Ekstrom, of New York, and E. H. Abadie, of Missouri. An enjoyable pleasure programme will be provided.

OUR CANADIAN LETTER.

SLOCAN, B. C.—A local company has proposed to install an electric light plant.

COBURG, ONT. — The town will apply to the legislature at its next session for power to construct electric light plants.

BRANTFORD, ONT.—Brantford is making estimates on a civic lighting plant. The present lighting contract expires next year.

WINNIPEG, MAN.—It has been decided to invite tenders for electric street lighting for a period of three to five years from April 25, 1898.

GATINEAU POINT, QUE. — Wm. Smith has been granted the contract for electric light systems. The plant will be installed at once. Mr. Dupont, C. E., of Montreal, prepared the plans.

MONTREAL, QUE.—Noble & Barber, electrical contractors, have started in business in this city. The successors to the electrical supply business of C. W. Pendeson, Bleury street, are Taylor, Telfer & Company, who will commence business at the same stand. J. A. C.

Montreal, December 20.

The eastern agency of the Card Electric Company, of Mansfield, Ohio, has been secured by E. P. Morris, of 15 Cortlandt street, New York city, who will have the exclusive control of all the business conducted by that firm in the East. Mr. Morris is also about to close a deal with the Highland Electro-Chemical Company, of Connellsville, Pa., to handle a soldering paste which they are going to place on the market.

ELECTRIC LIGHT FLASHES.

Hagerstown, Md., is discussing municipal ownership of the electric light plant.

The Somerville, Mass., Electric Light Company is to issue new bonds to the amount of $100,000.

The plant of the Colfax, Ore., Electric Light Company has been sold to Codd & MacKenzie. The price paid was $8,000.

At the annual meeting of the Westport, Ct., Water and Electric Light Company, the following officers were elected: President, William L. Coley; vice-president, W. H. Childs, of New York; secretary, John S. Jones; treasurer, F. W. Marsh, of Bridgeport; auditor, Charles Fable.

The stockholders of the Charlestown, Md., Electric Light, Heat and Power Company elected the following officers: President, John A. Livers; treasurer, H. S. Riley; secretary, B. D. Gibson; directors, John A. Livers, H. S. Riley, G. N. Horn, Adam Ertter, H. P. Thorn and B. D. Gibson.

At the annual meeting of the stockholders of the Edison Electric Light Company of York, Pa., the following board of directors was unanimously elected for the coming year: Judge W. F. Bay Stewart, Geoffrey P. Yost, C. A. Eisenhart, Adam F. Gessey, E. T. Moul, Dr. B. S. Gilbert, H. S. Wiest.

It is reported that a syndicate of Milwaukee men have purchased the two electric light and power plants in Beloit, Wis., the Beloit electric plant and Taylor's electric plant. A new company has been organized, A. E. Smith, of Milwaukee, being president; E. G. Cowdery, Milwaukee, secretary and treasurer, and G. L. Cole, vice-president.

At a meeting of the stockholders of the Hudson, N. Y., Light and Power Company, the following directors were chosen to serve for the ensuing year: C. W. Macy, Dr. C. E. Fritts, Dr. C. K. Van Vleck, John H. Jessup, D. H. Kennedy, C. H. Evans, Jr., F. J. Collier and Madison Miller. At a meeting of the directors C. W. Macy was elected president of the board; Dr. C. E. Fritts, vice-president, and Madison Miller, secretary and treasurer.

The Roanoke, Va., Rapids Power Company elected the following directors at the annual meeting: Stanford White, C. W. Weston, Winthrop Chanler, New York; Charles Cohn, W. M. Habliston, Petersburg; T. L. Emry, Roanoke Rapids. The directors then elected the following officers for the ensuing year: W. M. Habliston, president; Stanford White, vice-president; Winthrop Chanler, secretary and treasurer. Judge J. M. Mullen is attorney for the company.

Electric Light Plant Wanted.

The ELECTRICAL REVIEW is informed that the city of West Point, Miss., has about concluded to add an electric light plant to its waterworks. Manufacturers are requested to send information and prices to Mr. W. W. Robinson, West Point, Miss.

PITTSBURGH ELECTRICAL MATTERS.*

BY ROBERT P. PORTER.

At Carnegie I saw mighty masses of steel, weighing tons, handled by electric devices with the care and apparently delicate touch of a charming woman, who, with tiny sugar tongs poised over a teacup, says, "One or two lumps," and then dexterously drops the sugar in the cup with hardly a ripple. Thus are these mighty masses of heated iron put through various courses of treatment by the aid of a man in a car and a noiselessly running electric crane. I was told that the recent decrease in the course of structural steel was, in a large measure, due to the improved methods of handling these heavy ingots. Here we see the greatest work this country is doing in armor-plate, the most advanced work of the world, in structural steel, in boiler-plates and in all sorts of railway steel. Again, the works are so located and organized, that the supply alike of metal and fuel is direct, and comes from the regions most likely to withstand for the longest period the stupendous demands of the world. The cheap supply of raw material, and the great economies in handling the rails in all the advancing processes of manufacturing by machinery, has reduced the price at the mill to from $18 to $19 per ton, which will practically make the United States supreme in this branch of industry. England can not now compete with us in the advanced products of our steel mills.

The Westinghouse electrical concerns, located in the same district, have undoubtedly constructed the most advanced and the heaviest electrical power machinery. To this great Pennsylvania concern was given the work of conserving the power of Niagara itself, converting it into an electric current and distributing it over a large industrial territory. The machinery and apparatus for this purpose, which once seemed so novel and strange, are now rapidly multiplying. There are to be eight generators, each of 5,000 horse-power, for Niagara, while it is possible 15 may be required for similar works at St. Lawrence. These huge apparatuses may be seen in all stages in the Westinghouse shops, and they mark a new epoch in the world's economics—the era of economizing power. The century began with the era of how to make mechanical power, and it was made, but at a great waste. Now the brightest minds of the mechanical world are directing their attention to how to conserve mechanical energy, or rather how not to waste power.

In this line of discovery may be mentioned the Westinghouse experiments in the use of gas as a motive or heating power, which will not only create a new industry, but in all probability ultimately make gas, not steam, the primary source of power in running electric lighting plants and street railways. I saw in progress of construction the largest gas engine in the world. Its capacity will be 750 horse-power, while a second one has been projected of 1,200 horse-power. The Westinghouse people have all sizes of these engines in operation, some as high as 250 horse-power. The principles underlying the construction of these engines are new, and the result of 10 years of elaborate experiment. The effect will naturally be a revolution in the lighting of our cities, because gas can thus be used in place of steam engines for incandescent electric lighting, and for other purposes where uniform speed is desirable. Thus, by the utilization of new mechanical principles the introduction of electric lighting is going to increase instead of diminish the consumption of gas. With the gas, for example, which we hear the new Boston company is going to produce at 50 cents per 1,000 cubic feet, the modern gas engine will be far cheaper than the steam engine, and in some parts of the world will practically displace it.

"A new gas engine." That does not sound like a very startling announcement, and yet in establishing the economical working of a gas engine of 1,000 horse-power we enter upon a new and better and cheaper method of distributing both light and power. Gas, it should be remembered, is easily and cheaply distributed into places where it is extremely difficult and sometimes costly to place steam boilers and engines. The tendency in the production of gas is steadily downward, and the price which the lower grades of gas can be sold at not only suggests the practicability of producing electric illumination by gas, but opens up immense possibilities for the use of gas as a fuel. It will only be a short time before this method of distributing power will be adopted by our street railways. It costs enormously, as we all know, to distribute electric current, and carry it long distances. The waste forms a considerable part of the expense. If gas can economically be applied to engines of 1,200 horse-power, it naturally suggests the idea of a great central gas house making a quality of gas suitable for power which can be piped cheaply for any distance to supply engines for generating electric current for lighting or the propulsion of street cars or for heating houses. These are only a few hastily expressed thoughts on some of the industrial possibilities of the great Pennsylvania regions around Pittsburgh, where are located not only some of the greatest plants in the world, but where they are daily, nay, I might say, hourly, bringing about improvements that create new industries and put renewed life and energy into industries supposed to be on the decline.

*From the Philadelphia *Inquirer*.

PERSONAL.

Mr. C. E. Trump, president of the Novelty Electric Company, of Philadelphia, was a New York visitor last week. Mr. Trump reports the electrical field in his city as quite active.

Hertzian Telegraphy in France.*

A paper was read by M. Ducretet, on the 19th ultimo, before the Société Française de Physique on the above subject, and he showed some of his apparatuses, by means of which it is possible to carry out Hertz's experiments on electric waves. It was shown to be possible, without making any alterations or changes in the existing apparatus which is employed for this purpose, to produce either continuous or intermittent electric waves, to transmit them to a distance, to receive them and to record them. The transmitter shown was a Hertz oscillator with two spheres, which are immersed in an insulating fluid in just the same way as Professor Righi does with his large oscillators. This immersion in a liquid insulator is due to MM. Sarasin and De la Rive; it insures constancy in the production of oscillating discharges, and the electric waves produced are more energetic.

The model shown by M. Ducretet was of small dimensions and intended for lecture purposes. The small capacity of the spheres was sufficient to produce the oscillating discharge and to obtain very short wave lengths.

This oscillator is actuated by a small Rhumkorff coil, placed in the same manner as Professor Bose does, in a box with metallic sides and provided with a contact key in order to obtain short or long discharges, and as a result produce intermittent waves.

The Hertz spark resonator is replaced by one of M. Branly's tubes with filings. The filings enclosed in a tube and placed between two conductors, forming a circuit with a battery and a galvanometer, offer a very large resistance to the passage of a current; it becomes a good conductor when excited by an electric wave. This conductivity ceases suddenly, and is renewed when a fresh wave strikes the tube. This sensitiveness is very marked and shows itself at a distance. M. Branly, to whom the discovery of this is due, calls these receivers "radio-conducting tubes." They are the principal and indispensible part of the apparatus for the reception of electric waves at a distance.

M. Ducretet described the apparatus constructed for M. Popoff in 1895, which was made use of in St. Petersburg to receive and record electric waves as they were produced. In this case, the receiver is again a Branly tube with filings, placed in circuit with a battery and a relay which is actuated directly the Branly tube is affected by an electric wave emitted from a distance. The relay closes a circuit in which there is an electric bell, the hammer of which, however, instead of striking a gong, taps the sensitive tube, and so automatically restores it to its initial resistance directly the electric wave has ceased to act on it. The circuit comprises, besides this "bell," a registering apparatus to keep a record of the waves as they are received.

This apparatus, the result of well known researches, permits of the production, transmission, reception and recording of the electric waves; whether they are produced by atmospheric discharges or by means of an oscillator, it only remains to adapt its power according to the distance to be traversed.

M. Ducretet has made some alterations in the arrangement of the circuits; he makes use of a sensitive galvanometric relay, similar to those used in telegraphy, which he constructed with the help of MM. Maréchal and Rigollot; it is fitted with a damping arrangement, and an additional resistance is provided in order to suppress the "breaking spark," as they call it. The Morse register forms a second relay.

Without altering anything which has been described, M. Ducretet showed that the transmission and reception of these luminous waves enables signals sent across a space to be registered. M. Ducretet terms this application "Hertzian telegraphy."

M. Marconi was, no doubt, when making use of the known apparatus with which he transmits signals across space without wires, not aware of these researches.

M. Ducretet showed how the apparatus were, according to Professor Bose, to be arranged in order to carry out all the Hertz experiments, to show the analogy existing between the electric waves and the luminous waves; "reflection, refraction, diffraction, polarization." The apparatus is not large; the receiver, fixed on the pointer of a goniometer, is M. Branly's, or the one proposed by Professor Bose, and is derived from the radio-conductor with filings. All the parts forming the transmitter must be completely enclosed in a metallic box. An ebonite lens serves to concentrate the electric rays.

*From the London *Electrical Review*.

TELEPHONE NEWS AND COMMENT.

The Erie Telegraph and Telephone Company, of Lowell, Mass., added 335 subscribers to its system last month. It now has an aggregate of 24,222 subscribers.

Racine, Wis., has passed an ordinance requiring all lighting, telephone and other companies using poles in the streets to paint them a distinctive color, the color being decided by the city authorities.

At the annual meeting of the stockholders of the Eastern Telegraph Company, of Portland, Me., the following directors were elected; Chas. A. Tinker, of New York; Thos. Roche, of Boston; C. C. Bedlow, of Boston; Fredk. Robie, of Gorham; C. D. Livermore, J. W. Plaisted and J. D. Williams, of Portland. At the meeting of the board of directors the following officers were elected: President, Fredk. Robie, of Gorham; treasurer, C. C. Bedlow, of Boston; clerk, C. D. Livermore, of Portland.

Mr. F. S. Terry, of Chicago, was among the out-of-town visitors to New York last week.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

CROOKSTON, MINN.—E. M. Walsh will incorporate a company for the purpose of extending telephone line all through Polk County.

ASHEBORO, N. C.—The Asheboro Telephone Company has increased capital stock to $10,000. The incorporators are John T. Moffitt, C. C. McAlister, W. C. Hammer, P. H. Morris and Elijah Moffitt, who will establish telephone service.

RALEIGH, N. C.—A new telephone line is being constructed from Warren Plains to Raleigh.

JACKSONVILLE, TEX.—The East Telephone Company has been incorporated by J. B. Roberts, W. H. Story and C. M. Pittman to erect a telephone line from Tyler, Tex., to Shreveport, La.; capital stock, $2,000.

SANTA CRUZ, CAL.—The Pacific Coast Telephone Company has been incorporated by Gus Lim, C. F. W. Herrmann, Frank M. Gray and others; capital stock, $25,000.

FLINT, MICH.—The State Telephone Company has decided to establish an exchange in this city.

TOLUCA, ILL.—The Larose, Toluca & Eastern Telephone Company has been incorporated; capital stock, $2,000; incorporators, Lincoln L. Foster, Jonas T. Ball, Thomas C. Colehewer, Byron S. Harper and John D. Ball.

ALLEGHENY, PA.—The American Telephone Company has been granted a charter, with a capital stock of $1,000. The directors are Xavier Wittmer and Henry Wittmer, of Pittsburgh; D. C. Cawley, Allegheny; Frederick Klussman, Bennett, and F. B. McMullen, Glenshaw.

ELMO, TEX.—The Southwestern Telephone and Telegraph Company is now constructing a telephone line through town, which will be built from Terrell to Mineola and thence to Tyler, Tex.

ROSSVILLE, ILL.—The Danville Telephone Company has completed its new line to this place.

NORTHVILLE, N. Y.—The telephone line to this place, which has lately been under construction by the Hudson River Telephone Company, is nearly completed. One wire is ready for use and it is expected that the balance of the work will be completed in a day or so.

DETROIT, MICH.—The State Telephone Company has made connections with Kalamazoo Mutual Company.

CHATTANOOGA, TENN.—J. W. Coleman, of Columbia, is making an effort to establish a new telephone service in this city.

NASHVILLE, TENN.—The Oak Grove Telephone Company, of Jefferson County, has been incorporated by W. H. Smith, James A. Glass, W. R. Seahorn, James A. Seahorn, T. A. Cowan and F. M. Smith.

PRESCOTT, ARK.—A telephone system is to be established.

CENTREVILLE, TENN.—The Cumberland Telephone Company have line completed within 12 miles of this place.

FLORENCE, ALA.—Telephone communication is to be established between this city and Leighton.

ST. STEPHENS, ALA.—A telephone line from St. Stephens to Carson is in contemplation.

New Electric Railways.

BLUE RIDGE, PA.—Blue Ridge Electric Street Railway Company has been incorporated to operate along the roads near the Summer hotels; capital, $50,000.

KANSAS CITY, MO.—Work on the new electric line from Washington Park to Fairmount Park has been begun. The line is to be finished and ready for operation by the middle of March, 1898.

HARRISBURG, PA.—The Park Gate & Elwood Street Railway Company, to run from Park Gate, Beaver County, to Elwood City, Lawrence County, has been incorporated; capital, $25,000. Thomas Dugan, of Elwood City, is president.

ALBERT LEA, MINN.—City Clerk may give information concerning proposed electric line from this city to Geneva.

WEST UNION, W. VA.—There is much talk about the construction of new railroads in this part of the state just now.

ALBANY, N. Y.—The New York Beach Railroad Company has been incorporated with a capital of $50,000, to construct a street surface electric road five miles long in the town of Southfield, Richmond County. The directors are Albert Reynand, of New Dorp, S. I.; Ernest G. Wightman, of Stapleton, S. I.; Charles N. Harris, of 35 Nassau street; William B. Welde, William D. Stratton, Robert Emmet, H. T. Ferris, A. S. Drake and James P. Egan, of New York city.

LYKENS, PA.—A charter has been granted to the Lykens & Williams Valley Street Railway Company, capital, $200,000, to construct and operate an electric line between this place and Johnstown, a distance of 10 miles, taking in the towns of Wiconisco, Williamstown, Tower City, Reiner City and Bearmont on the way.

EAST ST. LOUIS, ILL.—There is considerable talk of building an electric road to Collinsville and another to Lebanon. It is said that a number of prominent men in St. Clair and Madison counties are interesting themselves in the movement.

CONNERSVILLE, IND.—The Connersville Street Railroad Company, with a capital of $25,000, has been incorporated. The directors are Charles Mount, Thomas Downs, E. M. Ansted, Daniel Roots and G. C. Flores.

BATH, ME.—Work on the electric road between Bath, Brunswick and Lewiston will commence in the Spring.

PITTSFIELD, MASS.—The Pittsfield Electric Street Railway have secured right of way through the Murphy property on West Housatonic street.

BALTIMORE, MD.—The Baltimore, Halethorpe & St. Denis Railroad Company, Oregon E. Benson, president, will erect electric power-house to operate its railway.

HOLLAND, MICH.—The Holland & Lake Michigan Electric Railroad has been granted an extension of time in which to build its road.

Electric Light and Power.

ALBANY, IND.—Steps are under way for the establishment of an electric light system at this place.

WHITEHALL, WIS.—The electric light plant put in by the village is now in operation.

LANCASTER, WIS.—The City Council of Lancaster recently gave a 10-year franchise to J. G. Harshberger to construct an electric light plant.

LEWISBURG, TENN.—Dr. S. T. Hardison has sold the electric light plant to Joseph Schensler.

CUERO, TEX.—The city has granted Mr. Otto Buchil and associates a franchise for planting poles and string electric light wires along the streets and alleys.

LAGRANGE, KY.—An electric light plant is to be established here.

LLANO, TEX.—Wm. Schumirth & Company will put in an electric light plant.

ATHENS, ALA.—The electric light plant is rapidly approaching completion and will soon commence operations.

NEW IBERIA, LA.—Silvio Broussard is adding arc systems of lighting to his electric plant. Machinery is all contracted for.

CHICAGO, ILL.—The municipal street lighting system is to be extended.

AVOCA, PA.—The Standard Electric Company has been incorporated with $40,000 capital.

COLUMBUS, NEB.—This city is negotiating for the purchase of the Columbus Electric and Power Company's plant with the intention of running and maintaining it.

JORDAN, MINN.—Contracts have been let to H. H. King & Company, of Minneapolis, for operating an electric plant with 18 arc lights for $9.50 a year for a term of five years.

CAVE SPRINGS, GA.—The Cave Springs Mill Company has been incorporated by R. S. Perry and Edward Mann, for operating electric light plant, etc.; capital stock, 1,500.

WINCHESTER, TENN.—The Winchester Electric Light Company will install a lighting plant.

AUGUSTA, ARK.—City Clerk may give information concerning electric light plant.

CARSONVILLE, MICH.—City Clerk may be addressed concerning erection of contemplated electric light plant.

New Incorporations.

BERWICK, ME.—The Paragon Arc Lamp Company has been organized for the purpose of manufacturing and dealing in electric and other devices with $10,000 capital stock. The officers are: President, Charles C. Barton, of Boston, Mass.; treasurer, John R. Hamner, of Boston.

TRENTON, N. J.—The Union Equipment Company, with an authorized capital of $1,500,000, has been incorporated. The company is formed to manufacture electric appliances and to equip steam and electric roads. The incorporators are Frederick Hitchcock, Glenn R. Gardner, and Francis J. Boyer, New York; F. W. Hunter, Cranford, N. J.; Frank G. Gourley, Stamford, Ct.

SAN ANTONIO, TEX.—The Texas Plumbing and Electrical Supply Company has been incorporated by John E. Martin, N. Y.; Petrich and William Martin, to do a general merchandise business; capital stock, $20,000.

Increase of Capital.

ST. LOUIS, MO.—The capital stock of the St. Louis & Belleville Electric Railway Company has been increased to $500,000.

Municipal Ownership.

[*From the Bridgeport, Ct., Farmer.*]

Commenting upon recent articles in the ELECTRICAL REVIEW on the question of municipal ownership of street railways, which include letters from eminent men who uniformly take the position that our present system brings to the front in municipal politics in large cities a class of men incapable of managing and sure to manage it corruptly, even if they possess the intelligence necessary to run it at all, the Hartford *Courant* says:

To expect that municipal authorities in our large cities could command the brains, the untiring energy and constant watchfulness necessary to run a street railway to the satisfaction of an American public is not justified by experience. The water supply is a much simpler matter, but it is estimated that the Croton aqueduct has cost New York twice as much as it would have cost a private company Until our large cities show themselves capable of selecting more honest and skilful public servants than the average alderman, it would be folly for them to undertake to conduct a large and complicated technical business like that of the transportation of passengers.

The Metal for Light.

[*From the Cincinnati Commercial-Tribune.*]

Agent—This lamp uses only one-half the oil of any other. It is made of aluminum.

Individual—I don't see what that's got to do with it?

Agent—Aluminum is the lightest metal known.

Kindred.... ...Interests

The American Surety Company, New York city, is sending to its friends a handsomely prepared card calendar for 1898 and 1899.

The Western Electric Company's Chicago plant will be enlarged by an addition of six more stories. About $80,000 will be expended.

The Western Electric Company, Chicago, has been made exclusive agent for the Tuerk alternating-current ceiling fan in the territory west of Pittsburgh. It has also been made exclusive agent for the car-heaters and office-heating devices manufactured by the Globe Heating Company.

The Joseph Dixon Crucible Company, Jersey City, N. J., have remembered the ELECTRICAL REVIEW with an acceptable Christmas present in the form of a box of assorted lead pencils. They are the best pencils available for newspaper men. Our appreciation and thanks are hereby extended.

William Roche, of 259 Greenwich street, New York city, who was formerly connected with the Manhattan Electric Supply Company, reports that there is such a demand for his new standard dry battery that it will be necessary to keep an extra force of men at work through the holidays, in order to fill the orders which are continually coming in.

James S. Barron & Company, of 30 Hudson street, New York city, agents for several large electrical firms, are selling a great quantity of the new hand-made telegraph-pole climbers which are manufactured by John Weldon. The climbers are made of highly tempered steel, and are so constructed that a new spur can be inserted at very low cost when the old one is worn out.

I. P. Frink, of 551 Pearl street, New York city, is receiving numerous orders for his window reflector from many of the stores which are making a special effort during the holidays for the sale of Christmas goods. The reflectors are especially adapted for window display, and are made in various sizes to fit almost any show-case. The incandescent lamps are fitted closely to the reflector, which is so adjusted that the light can be thrown in whatever direction desired for the best display of the goods.

The Electric Appliance Company, Chicago, are congratulating themselves upon the great record that is being make by O. K. weatherproof wire. Although this wire has been on the market for about 10 years, there is not a single recorded case where the insulation has not given the very best of satisfaction. O. K. weatherproof insulation has never been known to come off of the wire, and wherever used the insulation is good and hard after five or ten years of service. With this insulation a line with the insulation hanging in shreds or strings is an impossibility, as the insulation is put on in such a way that it is next to impossible for it to strip off. O. K. wire costs no more than other brands, and is deservedly very popular.

The Armory at Newburgh, N. Y., is to be enlarged and improved, and when completed will be one of the most convenient and complete company drill halls in the state. The drill hall is about 80 feet wide and 130 feet long. Among the contemplated improvements is the removing of the present wooden roof and replacing it with a new roof structure. The roof supports will consist of 11 steel trusses. These will be arranged to support the mezzanine floor where new lockers and equipment cases will be placed, and they will also support the visitors' gallery. The new roof, when completed, will be much lighter and will give the interior of the building a more roomy and substantial appearance. The Berlin Iron Bridge Company, of East Berlin, Ct., have the contract for furnishing and erecting the steel trusses, as well as the other iron work in the building, consisting of steel plates in the rifle pit, girders in the floor and walls, and other miscellaneous ironwork.

The "Electra" Carbons—Mr. Hugo Reisinger, 38 Beaver street, New York, sole agent for the celebrated "Electra" highest grade Nuernberg carbons, desires the ELECTRICAL REVIEW to publish the following in refutation of statements recently made:

"I wish to inform the trade that the word 'Electra' has been properly registered by me as my trade mark, and, therefore, can not be used by anybody else without infringing on my rights. The 'Electra' carbons are made, as heretofore, by the world renowned firm of C. Conradty, Nuernberg, who owns not only the oldest, but the most extensive, carbon works in existence, and whose carbons remain unequaled in quality and efficiency, having become the standard for electric lighting the world over. As to parties reported as makers of 'Electra' carbons, I wish to state that I have brought suit against them for having misused the trade-mark 'Electra,' and that they have been enjoined by the Nuernberg courts from making any carbons stamped 'Electra,' under penalty of 100 marks for each carbon. I shall guard the interest of buyers of my carbons as heretofore, and any information in regard to infringements on the registered trade-mark 'Electra' that will enable me to take legal proceedings will oblige."

For isolated plants the General Electric Company have recently issued an incandescent lamp catalogue, which is something of a departure and which should be of special interest and value to all lamp users. This catalogue contains descriptions of the class of lamps used by isolated station plants. The omission of all other types of lamps has made the catalogue a simple, concise pamphlet. It is something more than a catalogue, in that it contains several opening chapters of special value to lamp users, discussing improved methods of manufacture and showing how important special experience and facilities are in the production of the highest quality of incandescent lamps. Following this, the subject of selection of lamps is discussed with the idea of assisting the customer to obtain the lamp best suited to his conditions. Then an account is given of the requirements for the proper use of lamps and a pertinent example figured out showing the saving to be effected by proper lamp renewals. Following this opening account are the descriptions of the standard lamps as used by isolated plants, each description being accompanied by full sized illustrations of the lamps. Among others, the catalogue contains an account of 250-volt lamps. The catalogue is excellently gotten up, typographically, and contains a folder giving prices of the various types of lamps. The General Electric Company have endeavored to send copies of this catalogue to every isolated plant in this country and will be glad to furnish copies to any plant or customer desiring the same. Such a useful treatise should be in the hands of every purchaser of incandescent lamps and retained by them as a book of reference.

HELP WANTED—MALE

Northern Pacific & Alaska Mining, Transportation & Trading Company, owning thirty-five valuable quartz veins, and nearly a thousand acres of placers in richest Alaskan gold fields, will run steamers from Seattle and San Francisco to Snug Harbor, Cook's Inlet (where will be established a great commercial depot) and connect with only feasible rail route to Yukon, Klondike and Copper River Districts. Offers to investors unique proposition. Correspondence with first-class local or traveling salesman desired. Address (with reference) at Equitable Building, New York.

J. G. WHITE & COMPANY,
Incorporated,
ENGINEERS, CONTRACTORS.
Successors to White-Crosby Company, and J. G. White & Co.,
29 BROADWAY, NEW YORK, N. Y.
Baltimore Office, Equitable Building.

STORAGE BATTERIES
THE WILLARD BATTERY CO, CLEVELAND, O.

A. L. BOGART CO.
SUCCESSORS TO A. L. BOGART,
ELECTRIC GAS-LIGHTING SPECIALTIES
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Don't Travel— Telephone
24,000
telephones in actual use in New York City.
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15 Dey St. 952 Bway. 115 W. 38th St.

Every Visitor Will Be Interested

You have but to sit by and let the Exhibit do the talking. People who want to hear, hear easily.

ELECTRICAL EXHIBITION

MADISON SQUARE GARDEN

MAY, 1898.

If you haven't yet secured space, do not delay.
There is every promise that this will be the greatest display of the kind ever made.

300,000 Admissions in 1896. May be 1,000,000 in 1898.

ELECTRICAL EXHIBITION COMPANY,
MARCUS NATHAN, General Manager. 15 Cortlandt Street, New York.

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED DECEMBER 21, 1897.

595,688 Warp stop-motion for looms; W. H. Baker, Pawtucket, R. I.

595,695 Electric accumulator; C. P. F. Clerc, Paris, France.

595,712 Electric furnace; J. E. Hewes, Philadelphia, Pa.—In combination on electric furnace, electrodes and the circuit connections, a cord for suspending one of the electrodes, an eccentric acting on said cord and means for rotating said eccentric.

595,731 Electric motor; M. B. Pemgoet, Cambridge, Mass.

595,751 Wattmeter, E. K. Adams, New York, N. Y.—The combination in a wattmeter with an arm capable of displacement proportional to logrithmic of the number of watts in the circuit to be measured, an index or marker, and means for converting the displacement of said arm into displacement of the index or pointer proportionate to the number of watts.

595,754 Sub-station sending apparatus dispatch-tube system; B. C. Batcheller, Brooklyn, N. Y.

595,755 Pneumatic dispatch-tube system; B. C. Batcheller, Brooklyn, N. Y.—In an apparatus of the character described, the combination with an electric circuit, and a plurality of needles mounted upon a reciprocatory needle support, and means for reciprocating the same.

595,756 Sending apparatus for pneumatic dispatch-tube system; B. C. Batcheller, Brooklyn, N. Y.

595,768 Electric controlling device for paper-feeding machines; T. C. Dexter, Pearl River, N. Y.

595,777 Electric switch; H. F. Kleinschmidt, Hamburg, Germany—In combination, a channeled rail conductor, a main conductor or feeder extending along the channel of said rail conductor and a switch box supported by the feeder, said parts braced against the upper and lower flanges of the rail conductor.

595,803 Automatic switch for electrical apparatus; S. L. Barrett, New York, N. Y.

595,821 Method of, and apparatus for, multiple metering of electric currents; E. Oxley, Washington, D. C.

595,827 Insulator bracket; C. A. Woolsey, Brooklyn, N. Y.—In a device of the kind described, a removable cap, a slot therein, a clamping jaw movable out and in in the said lot, and a clamping bolt, having threaded engagements with the cap and swiveled engagements with the said jaw.

595,841 Electric meter; W. S. Weston, Chicago, Ill.

595,842 Circuit-closing device for burglar alarms; E. E. Wilson, Blackwood, N. J.

595,871 Electric burglar and fire-alarm; C. J. Bukoutz, Lamoille, Ill.

595,874 Electric elevator; A. L. Duweliius, Cincinnati, Ohio—A field magnet governor for electric elevators, consisting of a shaft, a carrier mounted thereon, weights of sector form pivoted to the carrier, an end thrust guided by the carrier, an equalizer thereon, and a connection between equalizer and each of the weights.

595,887 High-tension switch; H. Mueller, Nuremberg, Germany.

595,898 Electric motor; C. A. Stauffer, Philadelphia, Pa.

595,909 Electrical musical instrument; G. A. Brachhausen, Rahway, N. J.—The combination of a mechanical musical instrument, and an electric shocking device, the operation of the said electrical shocking device being governed from an element of the music playing devices of the musical instrument.

595,911 Electric clock; S. Fisher, New York, N. Y.

595,936 Electric arc lamp; A. Blahnik, Paris, France.

595,963 Electric burglar alarm; D. W. McCaughey, Chicago, Ill.—In an electric burglar alarm, the combination of a terminal or contact point, a longitudinally movable insulating block in which it is mounted, a hard metallic sleeve for protecting one end of the insulating block, and an outer hard metallic tube in which the parts are mounted for protecting the same.

595,970 Plug cut-out; F. S. Richmond, Chicago, Ill.

595,983 Telephone repeater; W. H. M. Weaver, Macon, Ga.

596,002 Electrical transmission of energy; R. M. Hunter, Philadelphia, Pa.

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The Englewood, Ill., Electric Light Company has just been purchased by the controlling interests of the Calumet Gas Company, $200,000 being the consideration at which the stock was delivered. The assets of the Englewood company, on January 1, 1897, amounted to $222,295.12, which included $4,510.99 cash and $216,682.14 in wires, dynamos, plant, etc. About 20,000 incandescent lights were then in actual service. The capital stock included $120,000 shares of common and $56,100 preferred. The Calumet Gas Company owns and operates gas and electric light plants at South Chicago, and on Garfield boulevard and Wallace street. J. J. Badenoch, recently Chief of Police, was the president and chief stockholder in the Englewood Electric Lighting Company. Among the directors in the Calumet Gas Company are J. R. Walsh, M. J. Russell and W. G. Beale. It is said that the Chicago Edison Company made overtures without success for the acquisition of the property, which now passes into the hands of the Calumet gas people.

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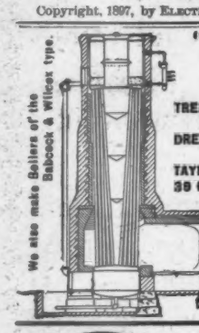

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It is a pleasure to state that the old subscribers of the ELECTRICAL REVIEW have renewed their subscriptions during the past season with scarcely an exception. The number of new subscribers added since July 1st has been unusually large—in fact, about double the number previously received in a like period.

We have also in preparation a considerable number of articles which will be of vital interest to the electrical field. These will appear at intervals during 1898. The ELECTRICAL REVIEW, in addition, will continue to give the news of the whole electrical field in a crisp and readable form. It is firmly believed that the changes and improvements outlined above will prove mutually valuable to our readers, our advertisers and ourselves.

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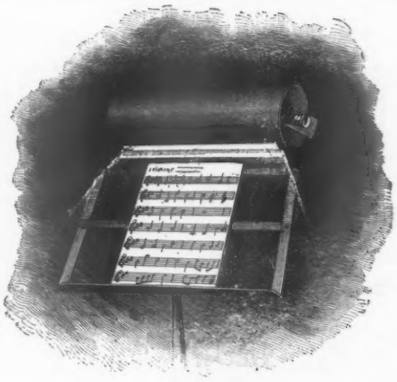

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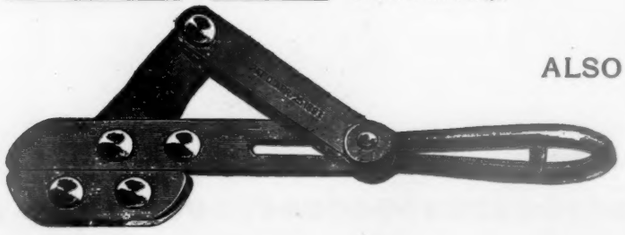

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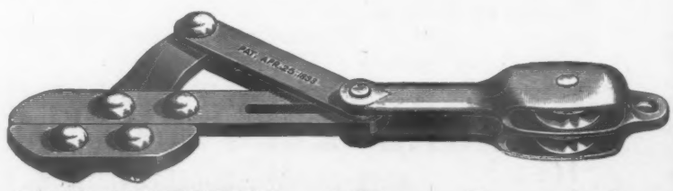

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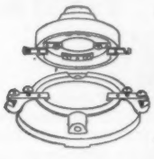

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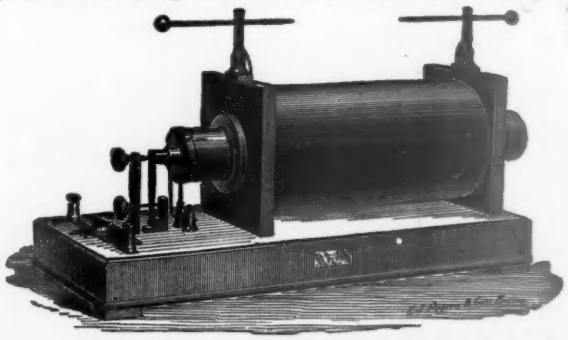

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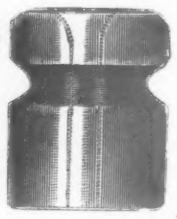

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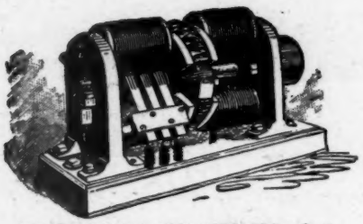

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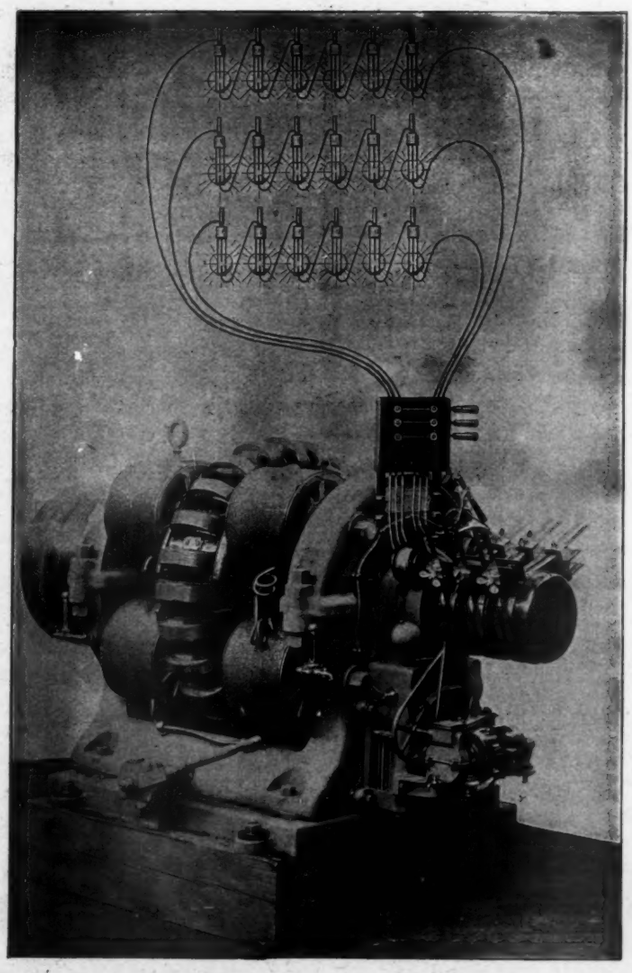

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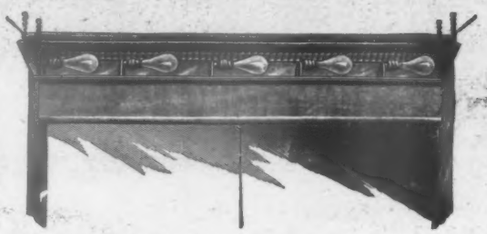

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Test of a 45 in. SAMSON, Jan. 25, '97.						Test of a 35 inch SAMSON, Feb. 1, '97.					
Gate Open.	Head.	Rev. Pr. Min.	Cu. Ft. Pr. Sec.	Horse Power.	Per Cent.	Gate Open.	Head.	Rev. Pr. Min.	Cu. Ft. Pr. Sec.	Horse Power.	Per Cent.
Full	15.00	144.00	172.69	240.97	82.03	Full	15.29	194.25	102.02	143.44	81.08
⅞	15.04	138.12	155.03	223.61	84.55	⅞	16.56	187.75	92.15	146.73	84.78
¾	15.11	127.67	133.24	191.06	83.68	¾	17.33	178.50	83.95	138.40	83.88
⅝	15.88	131.50	112.65	162.80	80 25	⅝	17.54	176.40	68.82	109.64	80.09
½	16.47	126.87	90.04	127.73	75.95	½	17.68	168.50	57.69	88.14	76.19

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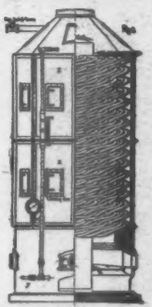

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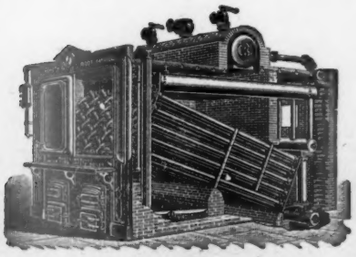

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